South African Sunflower crop

Quality Report
2017/2018 season

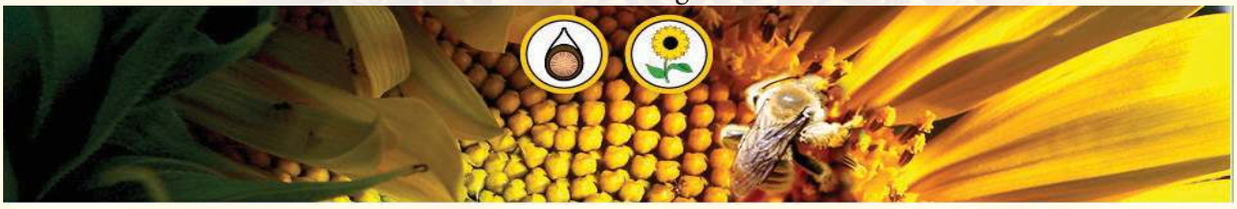
Index

Compiled and issued by:
The Southern African Grain Laboratory NPC

Grain Building - Agri-Hub Office
477 Witherite Road
The Willows
Pretoria
SOUTH AFRICA

PostNet Suite # 391
Private Bag X 1
The Willows
0041

Tel: +27 (12) 807 4019
Fax: +27(12) 807 4160
E-mail: info@sagl.co.za
Website: www.sagl.co.za



South African
Commercial sunflower quality for the 2017/2018 Season

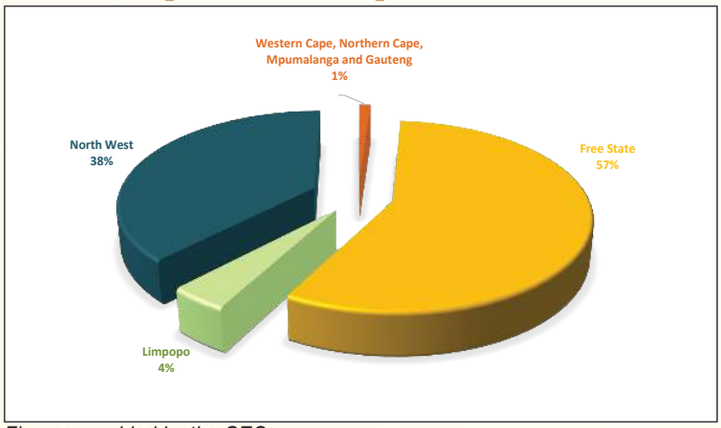
Acknowledgements
With gratitude to:

- ***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.*
- *The Bureau for Food and Agricultural Policy (BFAP) for providing research based market analysis.*

Introduction

The final commercial sunflower crop figure of the 2017/2018 season as overseen by the National Crop Estimates Liaison Committee (CELC) is 862 000 tons, an increase of 3 395 tons or 0.40% compared to the final crop estimate figure. The crop decreased by 1.4% (12 000 tons) year on year. The major sunflower-producing provinces, namely the Free State and North West, contributed 95% of the total crop.

Graph 1: Contribution of the provinces to the production of the 2017/2018 sunflower crop



Figures provided by the CEC.

During the harvesting season, a representative sample of each delivery of sunflower seed at the various grain intake points, was taken according to the prescribed grading regulations. The sampling procedure for the samples used in this survey is described on page 27. One hundred and seventy six (176) 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 sixth 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 is provided in table and graph format. Import and export figures over several seasons as well as information on the manufacture, import and export of oil seeds products, are also included.

The report of the Evaluation of sunflower cultivars 2017/2018 season conducted by the ARC-Grain Crops in collaboration with Agricol, Pannar, AGT, Pioneer and Syngenta is included in totality and as received, in this report. The national grading regulations as published in Government Notice NO. 45 of 22 January 2016 are also provided.

Production

World sunflower seed production for the 2017/2018 season stands at 49.6 million tons with the Ukraine and Russia contributing 49% to this total. The forecasted figure for the 2018/2019 season is 52.3 million tons. Please see Table 1 for the world sunflower seed supply and demand figures.

Table 1: World Sunflower Seed Supply and Demand (October through September)

Season	2013/14	2014/15	2015/16	2016/17	2017/18 (Revised)	2018/19 (Forecast)
Area Harvested (1 000 Ha)	***25 730***	***24 708***	***25 242***	***26 964***	***27 291***	***27 802***
Yield (MT/Ha)	***1.68***	***1.67***	***1.70***	***1.86***	***1.82***	***1.88***
Production (1 000 MT)						
Argentina	2 250	3 000	2 830	3 300	3 400	3 800
European Union	9 105	9 006	7 769	8 641	9 985	9 546
China	2 423	2 380	2 698	2 750	2 800	2 860
Russia	10 200	9 000	9 700	11 600	11 000	12 000
Ukraine	10 941	10 250	12 100	15 100	13 500	15 500
United States	917	1 005	1 326	1 203	978	961
South Africa	736	736	755	874	859	740
Turkey	1 450	1 350	1 350	1 470	1 700	1 540
Other	5 315	4 607	4 386	5 130	5 343	5 341
TOTAL	***43 337***	***41 334***	***42 914***	***50 068***	***49 565***	***52 288***
Import (1 000 MT)						
Turkey	581	523	436	611	721	780
European Union	329	275	577	632	520	600
Other	1 050	1 078	1 100	1 396	1 305	1 346
TOTAL	***1 960***	***1 876***	***2 113***	***2 639***	***2 546***	***2 726***
Export (1 000 MT)						
Argentina	80	63	302	74	58	100
United States	132	126	107	99	89	70
Russia	131	61	105	362	98	200
Ukraine	71	123	171	261	50	200
Other	1 536	1 462	1 467	1 804	2 253	2 155
TOTAL	***1 950***	***1 835***	***2 152***	***2 600***	***2 548***	***2 725***
Oilseed crushed	***38 360***	***36 581***	***38 177***	***44 845***	***44 974***	***47 114***

National Sunflower Association website www.sunflowernsa.com, Table updated February 8, 2019; Source: Oil World & USDA.

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. Planting sunflowers is also advantageous when rainfall occurs late in the season, due to the late planting window relative to that of maize.

The area utilized for sunflower production decreased by 5.4% to 601 500 ha, compared to the 635 700 ha of the previous season. This season's area planted are in line with the 5-year average of 606 780 hectares. The national yield average increased by 4.4% to 1.43 t/ha, the highest national average to date.

According to *The Bureau for Food and Agricultural Policy (BFAP) Baseline, Agricultural Outlook 2018 – 2027*, sunflower area is expected to decline marginally over the outlook period, additional demand will however be met comfortably by increasing yields. Yields are projected to increase by an average of 2.2% per year, reaching 1.65 t/ha by 2027. This projected growth in yield is based on the assumption of stable rainfall and cultivars improving continuously. Average yields over the past five years have not reflected the potential of current varieties due to adverse weather conditions (extreme droughts and temperatures) in four of the five seasons. The adoption of the latest release of high-yielding cultivars with Clearfield® technology that significantly reduces weed pressure and increases yield, is rapidly gaining ground. Average yields are therefore expected to improve going forward.

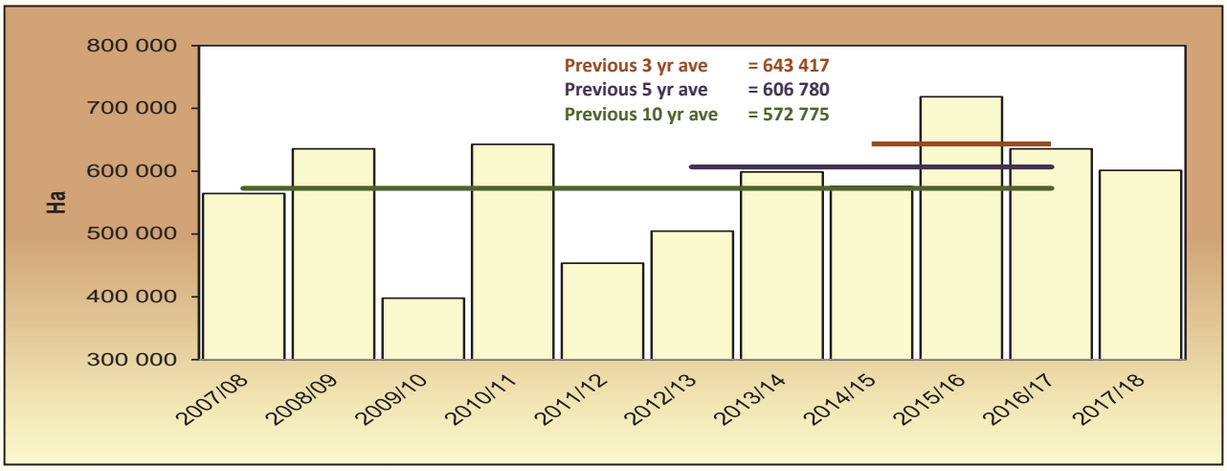
Please see Table 2 for an overview of sunflower production under dry land conditions versus irrigation in the 2017/2018 season, compared to the 2016/2017 season. Graphs 2 to 4 provide national figures with regards to hectares planted, tons produced and yields obtained over the last 11 seasons and Graphs 5 to 10 similar figures for the major sunflower producing provinces, namely the Free State and North West as well as Limpopo.

Table 2: Sunflower production overview over two seasons

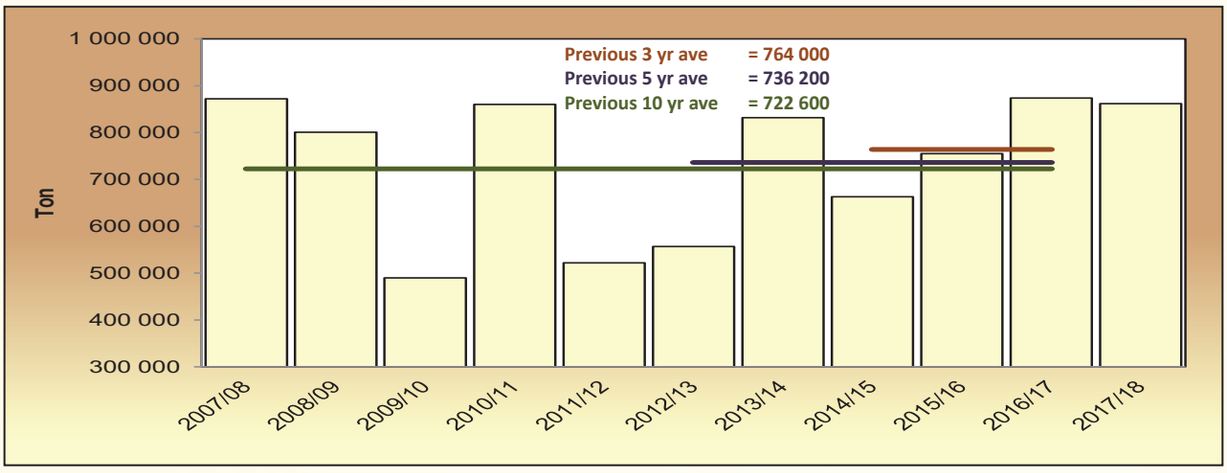
Province	Type of production	2017/2018			2016/2017		
		Hectares planted, ha	Production, tons	Yield, t/ha	Hectares planted, ha	Production, tons	Yield, t/ha
Western Cape	Dryland	100	100	-	-	-	-
	Irrigation	-	-	-	-	-	-
	Total	100	100	-	-	-	-
Northern Cape	Dryland	-	-	-	-	-	-
	Irrigation	1 600	1 920	1.20	250	400	1.60
	Total	1 600	1 920	1.20	250	400	1.60
Free State	Dryland	312 200	486 000	1.56	328 000	475 000	1.45
	Irrigation	1 800	4 000	2.22	2 000	3 000	1.50
	Total	314 000	490 000	1.56	330 000	478 000	1.45
Eastern Cape	Dryland	-	-	-	-	-	-
	Irrigation	-	-	-	-	-	-
	Total	-	-	-	-	-	-
KwaZulu-Natal	Dryland	-	-	-	300	300	1.00
	Irrigation	-	-	-	-	-	-
	Total	-	-	-	300	300	1.00
Mpumalanga	Dryland	2 300	2 180	0.95	2 200	2 300	1.05
	Irrigation	-	-	-	-	-	-
	Total	2 300	2 180	0.95	2 200	2 300	1.05
Limpopo	Dryland	44 500	34 750	0.78	87 500	82 500	0.94
	Irrigation	500	1 250	2.50	2 500	3 000	1.20
	Total	45 000	36 000	0.80	90 000	85 500	0.95
Gauteng	Dryland	5 050	4 500	0.89	2 600	2 500	0.96
	Irrigation	450	1 100	2.44	400	500	1.25
	Total	5 500	5 600	1.02	3 000	3 000	1.00
North West	Dryland	231 900	323 950	1.40	207 500	300 000	1.45
	Irrigation	1 100	2 250	2.05	2 500	4 500	1.80
	Total	233 000	326 200	1.40	210 000	304 500	1.45
RSA	Dryland	596 050	851 480	1.43	628 100	862 600	1.37
	Irrigation	5 450	10 520	1.93	7 650	11 400	1.49
	Total	601 500	862 000	1.43	635 750	874 000	1.37

Figures provided by the CEC.

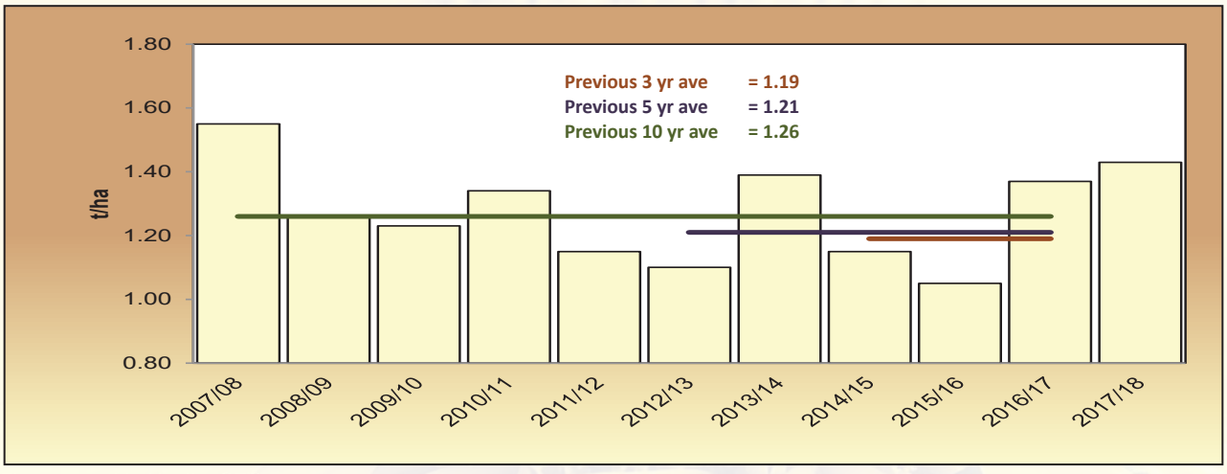
Graph 2: Total RSA area utilised for sunflower production from 2007/08 to 2017/18



Graph 3: Sunflower production in RSA from 2007/08 to 2017/18

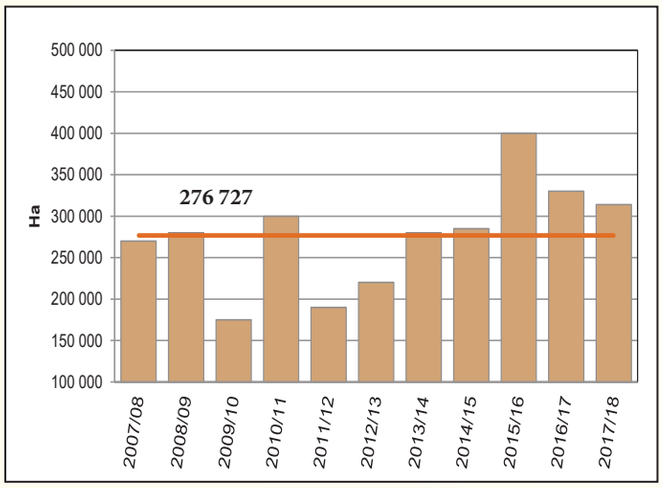


Graph 4: RSA Sunflower yield from 2007/08 to 2017/18

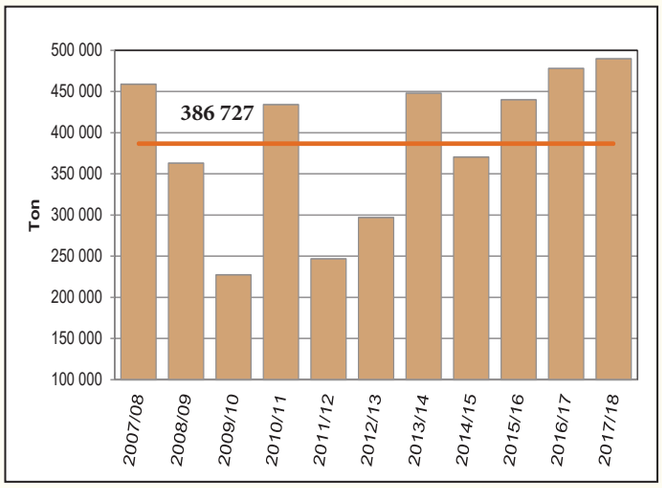


Figures provided by the CEC.

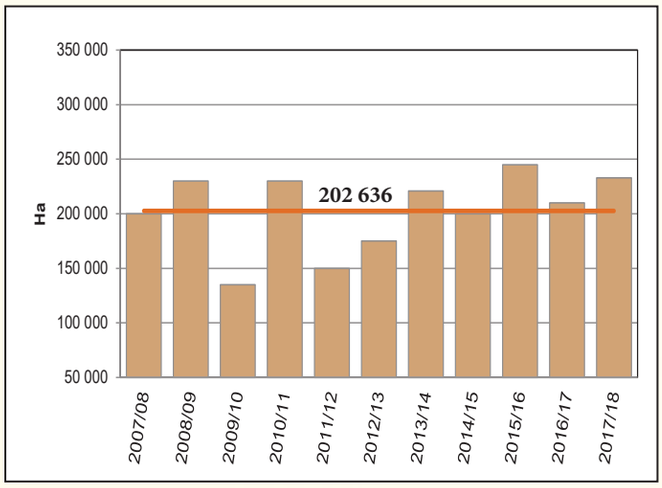
Graph 5: Area utilised for sunflower production in the Free State since 2007/08



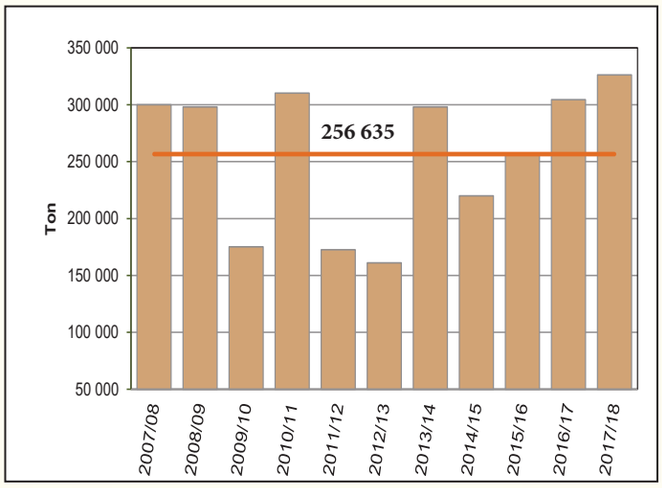
Graph 6: Sunflower production in the Free State since 2007/08



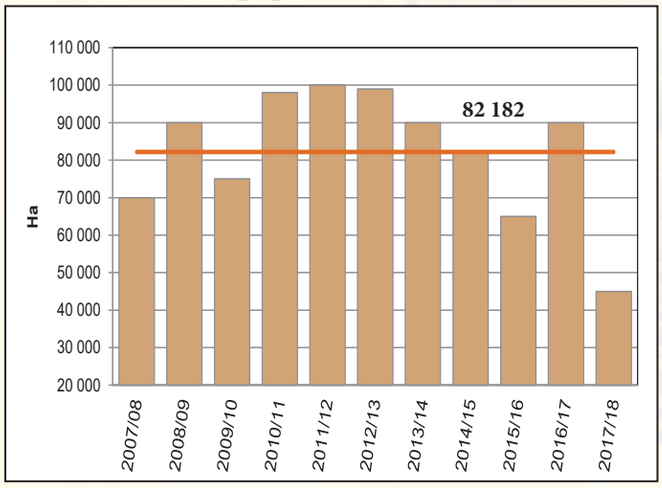
Graph 7: Area utilised for sunflower production in North West since 2007/08



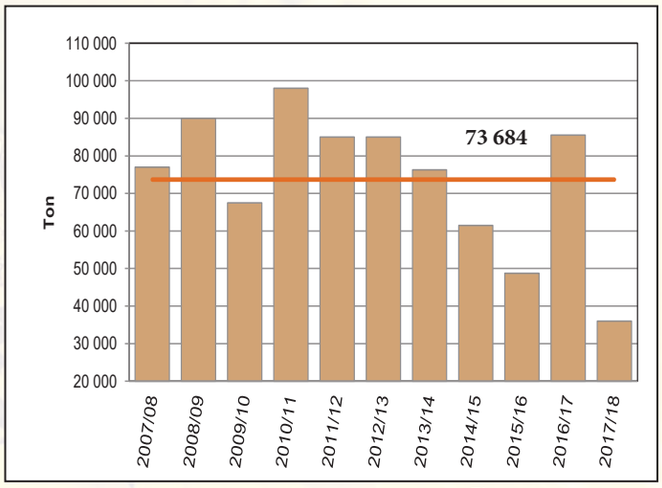
Graph 8: Sunflower production in North West since 2007/08



Graph 9: Area utilised for sunflower production in Limpopo since 2007/08



Graph 10: Sunflower production in Limpopo since 2007/08



Figures provided by the CEC.

Supply and Demand

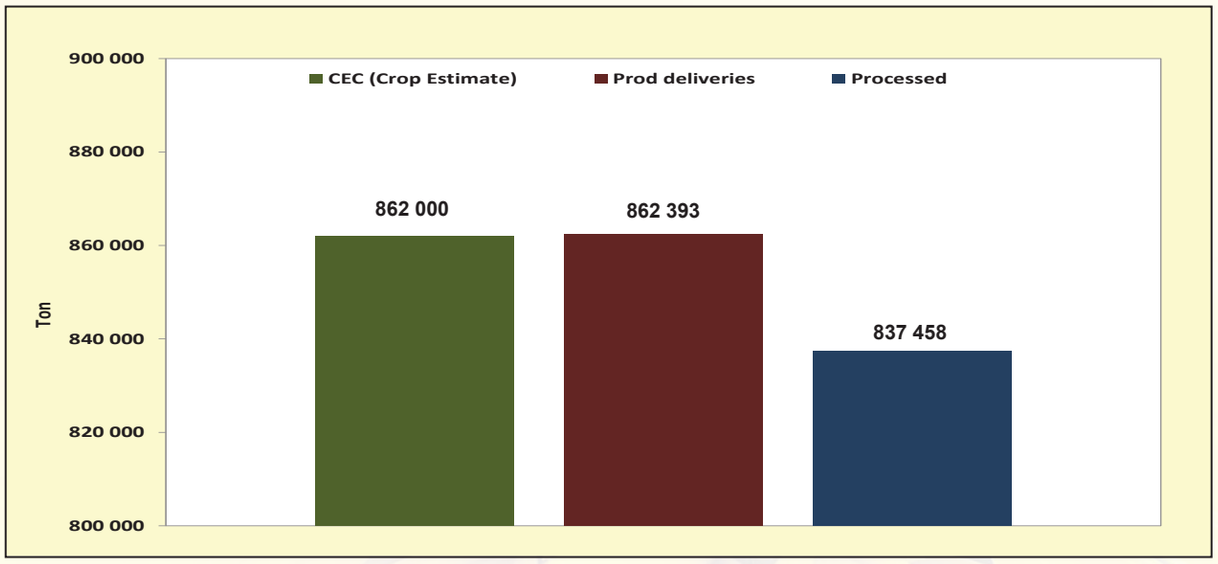
The sunflower seed marketing season dates from March to February. According to SAGIS supply and demand figures for the 2018/2019 marketing season to date (March 2018 to January 2019), opening stock declined by 5% compared to the previous marketing season, but exceeds the 10-year average by 64% (60 411 tons).

To date, 1 324 tons of sunflower and sunflower seed products have been imported compared to the 554 and 70 643 tons of the previous two seasons respectively. The 10-year average is 42 075 tons. According to *BFAP Baseline*, total vegetable oil demand (including palm oil) increased by an average of 3% per annum over the last 10 years. 41% of this consumption figure was produced locally in 2017. During 2007 to 2017, sunflower oil consumption increased by an average of 2% per year. Over the 2018 to 2027 period, sunflower oil consumption is projected to increase on average by 1.3% per year, while sunflower oil production is expected to expand by an annual average of 1.8%, in line with the slowdown in sunflower seed production.

Of the 837 458 tons of sunflower seeds processed so far, only 1 468 tons (0.2%) was used for human consumption and 4 773 tons (0.6%) for animal feed. The vast majority of sunflower seed is crushed to produce oil and oilcake. The amount of sunflower seeds crushed to date is 5% less than in the 2017/2018 marketing season. According to *BFAP,* total oilcake demand increased by almost 30% over the past decade to 1.7 million tons in 2017. A further increase of 28% to 2.18 million tons by 2027 is projected. Only 20% of total oilcake demand was supplied locally in 2007, this increased to 67% in 2017. It is projected that 90% of total oilcake demand will be supplied by local facilities by 2027.

Exports to date amount to 413 tons (274 tons during 2017/2018). Globally, Russia and the United States were the largest exporters of sunflower seeds during 2017/2018. The Ukraine, followed by Russia accounted for 76% of total sunflower oil exports worldwide in the corresponding period *(National Sunflower Association website www.sunflowernsa.com, Table updated February 8, 2019; Source: Oil World & USDA).*

Graph 11: Sunflower supply and demand overview for the current marketing season (Mar 2018 - Feb 2019)

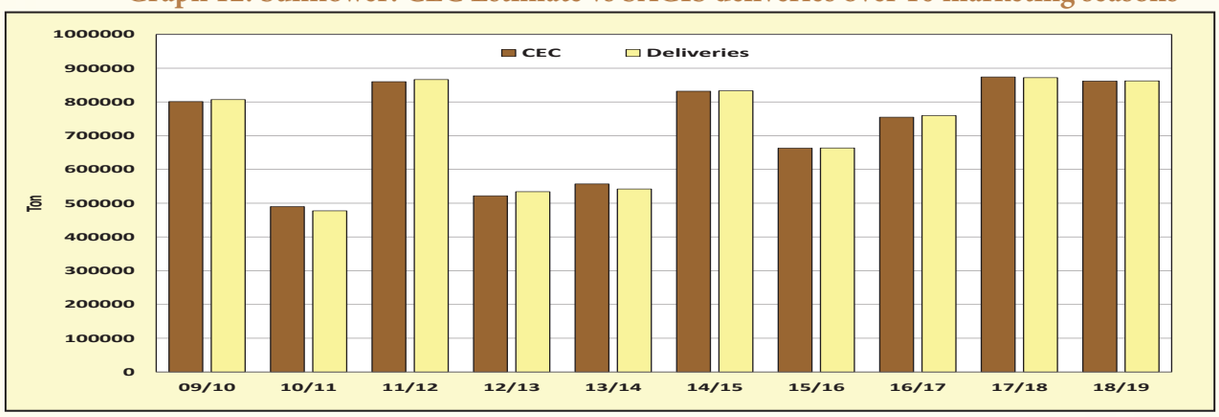


Information provided by SAGIS.

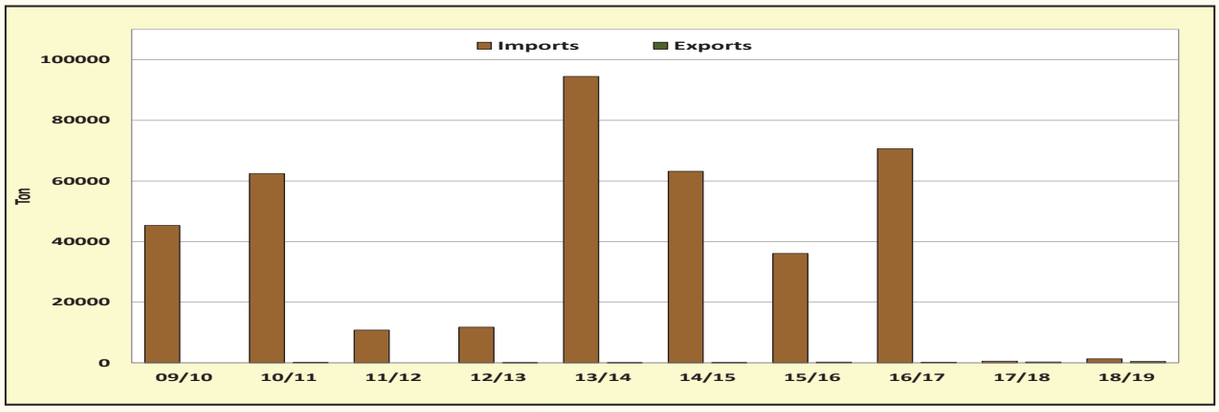
SAGIS South African Grain Information Service
Suid-Afrikaanse Graan Inligtingsdiens

SUNFLOWERSEED: SUPPLY AND DEMAND TABLE BASED ON SAGIS' INFO (TON)																		Publication date: 2019-02-29	
	Season (Mar - Feb)																	Current Season Mar-Jan	10 Year average
	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	16/17	17/18	18/19	2008-09-2017/18
																		***	
																		11	
CEC (Crop Estimate)	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	755 000	874 000	862 000	722 600
SUPPLY																			
Opening stock (1 Mar)	50, 00	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	45 867	163 086	154 841	94 430
Prod deliveries	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	833 165	663 669	759 614	872 171	862 393	720 214
Imports	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	36 064	70 643	554	1 324	42 075
Surplus	0	0	0	0	3 800	2 300	1 500	4 100	700	2 000	3 800	5 485	4 689	5 948	9 897	4 268	12 173	6 049	5 306
Total Supply	**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**	**802 557**	**880 392**	**1 047 984**	**1 024 607**	**862 025**
DEMAND																			
Processed	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	847 682	747 808	707 327	885 039	837 458	741 313
-human	800	100	1 300	700	1 300	1 200	2 100	2 400	1 900	1 600	1 300	904	1 162	467	1 003	1 192	1 487	1 468	1 342
-animal feed	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	8 995	10 665	5 737	4 773	4 679
-crush (oil and oilcake)	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	737 810	695 470	877 815	831 217	735 292
Withdrawn by producers	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	1 157	605	442	499	2 412
Released to end-consumers	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	2 936	2 867	2 592	1 696	3 267
Seed for planting purposes	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	2 824	3 474	3 026	3 563	2 893
Net receipts(-)/disp(+)	3 200	2 900	500	-2 000	900	1 500	0	1 000	-400	1 000	-1 200	-1 716	606	1 081	1 709	2 828	1 770	510	668
Deficit	6 900	3 900	9 600	3 100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	1 300	45 500	200	200	0	100	0	79 400	0	100	0	27	8	48	256	205	274	413	8 032
Total Demand	**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**	**756 690**	**717 306**	**893 143**	**844 139**	**758 584**
Ending Stock (28 Feb)	**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**	**45 867**	**163 086**	**154 841**	**180 468**	**103 441**
- processed p/month	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	62 317	58 944	73 753	76 133	62 680
- months' stock	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	0.7	2.8	2.1	2.4	1.4

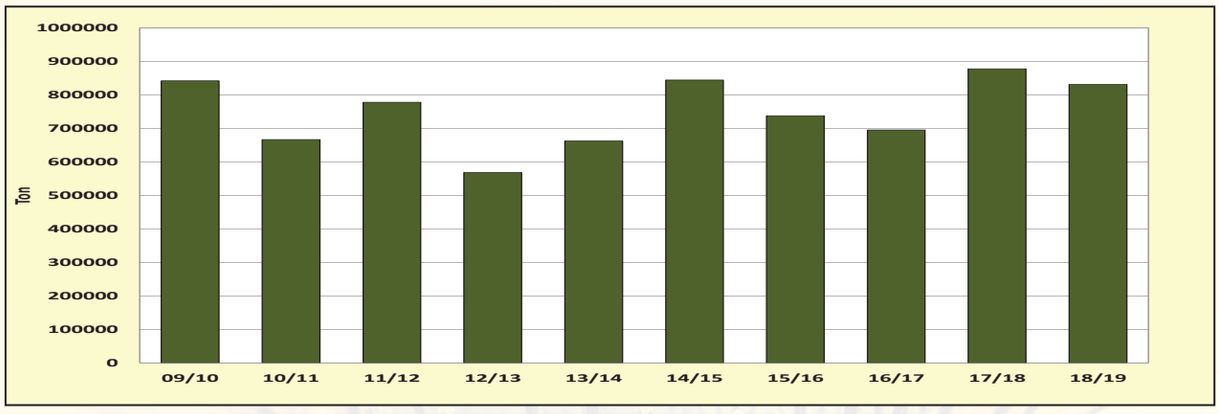
Graph 12: Sunflower: CEC Estimate vs SAGIS deliveries over 10 marketing seasons



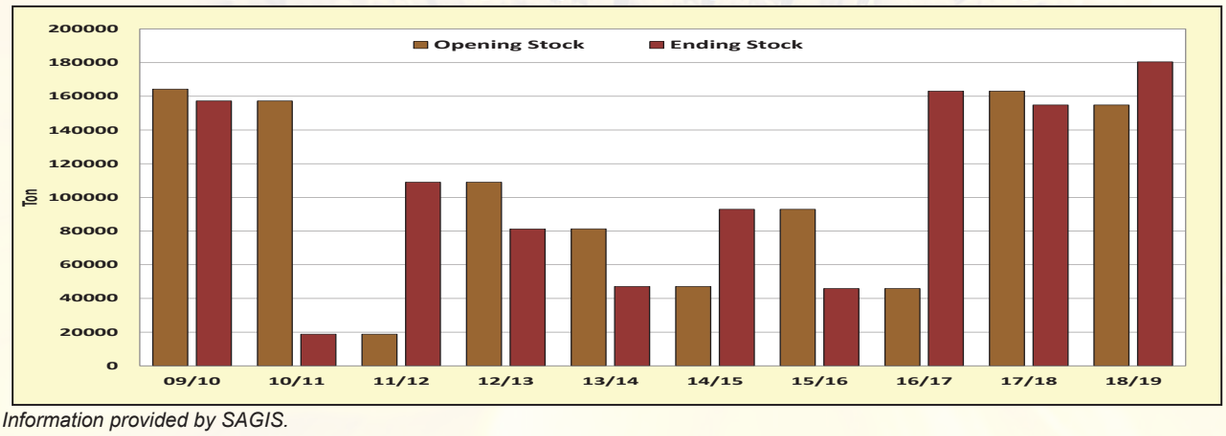
Graph 13: Sunflower: Imports and Exports over 10 marketing seasons



Graph 14: Sunflower: Crushed over 10 marketing seasons



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



Information provided by SAGIS.

Season	WHOLE SUNFLOWER: IMPORTS FOR RSA PER COUNTRY (Tons)											
	Argentina	Botswana	Bulgaria	China	Egypt	Malawi	Mozambique	Romania	Ukraine	United Kingdom	Zambia	Total
2014/2015	42	4 764	0	0	0	574	0	57 800	0	0	0	63 180
2015/2016	80	4 518	0	0	0	663	0	30 531	0	0	272	36 064
2016/2017	42	1 424	38 434	0	0	686	0	30 015	19	23	0	70 643
2017/2018	21	0	0	18	44	429	19	0	0	23	0	554
2018/2019	65	381	0	0	23	855	0	0	0	0	0	1 324

Season	SUNFLOWER: IMPORTS PER HARBOUR (Tons)					
	Harbours					
	East London	Durban	Cape	Port Elizabeth	Richards Bay	Total
2005/2006	0	18	0	0	0	18
2006/2007	0	0	0	0	0	0
2007/2008	0	19	0	0	0	19
2008/2009	0	0	0	0	0	0
2009/2010	0	66 547	0	0	0	66 547
2010/2011	0	50 209	0	0	0	50 209
2011/2012	0	0	0	0	0	0
2012/2013	0	0	0	0	0	0
2013/2014	0	92 832	0	0	0	92 832
2014/2015	0	57 842	0	0	0	57 842
2015/2016	0	30 611	0	0	0	30 611
2016/2017	0	68 533	0	0	0	68 533
2017/2018	0	44	62	0	0	106
2018/2019*	0	88	0	0	0	88

* Progressive March 2018 - January 2019
Note: Includes Imports for RSA and Other Countries

Season	WHOLE SUNFLOWER: RSA EXPORTS PER COUNTRY (Tons)					
	Australia	Botswana	Namibia	Swaziland	Zimbabwe	Total
2014/2015	22	0	0	26	0	48
2015/2016	0	10	158	88	0	256
2016/2017	0	40	48	107	10	205
2017/2018	0	23	136	115	0	274
2018/2019	0	10	279	124	0	413

Season	SUNFLOWER: EXPORTS PER HARBOUR (Tons)					
	Harbours					
	East London	Durban	Cape	Port Elizabeth	Richards Bay	Total
2005/2006	0	113	0	0	0	113
2006/2007	0	0	0	0	0	0
2007/2008	0	0	0	0	0	0
2008/2009	34 870	44 555	0	0	0	79 425
2009/2010	0	0	0	0	0	0
2010/2011	0	0	0	0	0	0
2011/2012	0	0	0	0	0	0
2012/2013	0	0	0	0	0	0
2013/2014	0	0	0	0	0	0
2014/2015	0	22	0	0	0	22
2015/2016	0	0	0	0	0	0
2016/2017	0	0	0	0	0	0
2017/2018	0	0	0	0	0	0
2018/2019*	0	0	0	0	0	0

* Progressive March 2018 - January 2019

SAGIS South African Grain Information Service NPC
Suid Afrikaanse Graaninligtingsdiens NWM
Reg no. 1997/019186/08

	OIL SEEDS PRODUCTS PER MONTH MANUFACTURED												
	Marketing year Mar 2017 - Feb 2018 Progressive: 12 Months	**Mar 2018** Manufactured Tons	**Apr 2018** Manufactured Tons	**May 2018** Manufactured Tons	**Jun 2018** Manufactured Tons	**Jul 2018** Manufactured Tons	**Aug 2018** Manufactured Tons	**Sep 2018** Manufactured Tons	**Oct 2018** Manufactured Tons	**Nov 2018** Manufactured Tons	**Dec 2018** Manufactured Tons	**Jan 2019** Manufactured Tons	**Market-ing year Mar 2018 - Jan 2019** Progressive: 11 Months
Palm Oil and Derivatives	**0**	0	0	0	0	0	0	0	0	0	0	0	**0**
Soybean Oil	**152 434**	12 850	11 864	13 246	14 062	13 739	13 329	16 219	17 253	19 301	17 766	17 932	**167 561**
Sunflower Oil	**319 052**	30 784	19 667	22 546	33 366	33 293	27 545	29 388	30 893	25 846	20 187	21 228	**294 743**
Cottonseed Oil	**0**	0	0	0	0	0	0	0	0	0	0	0	**0**
Coconut Oil/ Groundnut Oil/ Canola Oil/ Corn (Maize) Oil/ Blends or mixes of Oils which includes one of the above Oils/ Biodiesel	**55 278**	4 691	4 091	4 881	4 556	5 044	4 059	4 732	4 904	4 887	2 676	4 396	**48 917**
Cottonseed Oilcake	**0**	0	0	0	0	0	0	0	0	0	0	0	**0**
Sunflower Oilcake	**369 122**	34 248	21 769	27 349	38 949	38 679	32 844	35 862	38 795	32 589	24 986	26 679	**352 749**
Coconut Oilcake	**0**	0	0	0	0	0	0	0	0	0	0	0	**0**
Palmnut Oilcake	**0**	0	0	0	0	0	0	0	0	0	0	0	**0**
Soybean Oilcake/ Canola Oilcake	**722 794**	60 566	53 336	65 277	65 899	64 898	61 512	76 837	81 418	89 620	80 734	84 769	**784 866**
Soybean Flours and Meals/ Textured Vegetable Protein	**35 121**	2 675	3 106	2 898	3 628	3 298	3 461	3 649	3 408	3 454	2 344	3 600	**35 521**
Soybean Fullfat	**155 345**	15 003	14 607	17 206	16 605	18 103	19 396	20 229	22 631	22 582	17 245	20 571	**204 178**
Peanut Butter and Paste	**30 422**	2 461	2 386	2 814	2 492	2 433	2 403	2 809	2 704	2 642	2 969	1 299	**27 412**
Total	**1 839 568**	**163 278**	**130 826**	**156 217**	**179 557**	**179 487**	**164 549**	**189 725**	**202 006**	**200 921**	**168 907**	**180 474**	**1 915 947**

SAGIS South African Grain Information Service NPC
Suid Afrikaanse Graaninligtingsdiens NWM
Reg no. 1997/019186/08

	OIL SEEDS PRODUCTS PER MONTH IMPORTED												
	Marketing year Mar 2017 - Feb 2018 Progressive: 12 Months	**Mar 2018** Manufactured Tons	**Apr 2018** Manufactured Tons	**May 2018** Manufactured Tons	**Jun 2018** Manufactured Tons	**Jul 2018** Manufactured Tons	**Aug 2018** Manufactured Tons	**Sep 2018** Manufactured Tons	**Oct 2018** Manufactured Tons	**Nov 2018** Manufactured Tons	**Dec 2018** Manufactured Tons	**Jan 2019** Manufactured Tons	**Market-ing year Mar 2018 - Jan 2019** Progressive: 11 Months
Palm Oil and Derivatives	**323 198**	24 727	22 454	20 288	38 237	21 346	20 880	36 716	18 261	28 811	18 383	37 757	**287 860**
Soybean Oil	**50 123**	1 500	3 500	4 250	0	3 100	1 000	7 085	4 000	0	0	2 358	**26 793**
Sunflower Oil	**81 034**	44	9 063	3 000	0	9 006	0	9 998	3 018	2 482	5 934	4 976	**47 521**
Cottonseed Oil	**1 995**	0	0	0	0	0	0	750	0	0	2 500	0	**3 250**
Coconut Oil/ Groundnut Oil/ Canola Oil/ Corn (Maize) Oil/ Blends or mixes of Oils which includes one of the above Oils/ Biodiesel	**4 789**	560	500	70	410	670	30	240	850	400	320	1 050	**5 100**
Cottonseed Oilcake	**167**	0	0	0	0	0	0	0	0	0	0	0	**0**
Sunflower Oilcake	**24 166**	0	0	9 604	9 956	0	7 392	0	0	6 565	0	0	**33 517**
Coconut Oilcake	**0**	0	0	0	0	0	0	0	0	0	0	0	**0**
Palmnut Oilcake	**0**	0	0	0	0	0	0	0	0	0	0	0	**0**
Soybean Oilcake/ Canola Oilcake	**438 555**	20 262	41 884	32 737	44 445	14 178	28 806	51 009	16 385	39 671	42 996	0	**332 373**
Soybean Flours and Meals/ Textured Vegetable Protein	**0**	0	0	0	0	0	0	0	0	0	0	0	**0**
Soybean Fullfat	**0**	0	0	0	0	0	0	0	0	0	0	0	**0**
Peanut Butter and Paste	**1 320**	304	177	0	81	49	55	0	47	39	37	55	**844**
Total	**925 347**	**47 397**	**77 578**	**69 949**	**93 129**	**48 349**	**58 163**	**105 798**	**42 561**	**77 968**	**70 170**	**46 196**	**737 258**

SAGIS South African Grain Information Service NPC
Suid Afrikaanse Graaninligtingsdiens NWM
Reg no. 1997/019186/08

	OIL SEEDS PRODUCTS PER MONTH EXPORTED												
	Marketing year Mar 2017 - Feb 2018 Progressive: 12 Months	**Mar 2018** Manufactured Tons	**Apr 2018** Manufactured Tons	**May 2018** Manufactured Tons	**Jun 2018** Manufactured Tons	**Jul 2018** Manufactured Tons	**Aug 2018** Manufactured Tons	**Sep 2018** Manufactured Tons	**Oct 2018** Manufactured Tons	**Nov 2018** Manufactured Tons	**Dec 2018** Manufactured Tons	**Jan 2019** Manufactured Tons	**Market-ing year Mar 2018 - Jan 2019** Progressive: 11 Months
Palm Oil and Derivatives	**23 661**	908	822	983	1 092	1 176	1 400	1 231	1 088	896	258	1 023	**10 877**
Soybean Oil	**33 775**	4 513	5 771	3 989	1 831	1 942	1 888	817	1 727	1 562	2 009	1 465	**27 514**
Sunflower Oil	**2 151**	120	64	719	132	227	166	193	97	109	206	83	**2 116**
Cottonseed Oil	**0**	0	0	0	0	0	0	0	0	0	0	0	**0**
Coconut Oil/ Groundnut Oil/ Canola Oil/ Corn (Maize) Oil/ Blends or mixes of Oils which includes one of the above Oils/ Biodiesel	**2 308**	64	197	83	65	139	16	101	67	4	51	91	**878**
Cottonseed Oilcake	**0**	0	0	0	0	0	0	0	0	0	0	0	**0**
Sunflower Oilcake	**2 343**	208	33	193	56	306	363	196	676	674	167	103	**2 975**
Coconut Oilcake	**0**	0	0	0	0	0	0	0	0	0	0	0	**0**
Palmnut Oilcake	**0**	0	0	0	0	0	0	0	0	0	0	0	**0**
Soybean Oilcake/ Canola Oilcake	**13 141**	1 323	996	1 228	1 291	893	1 056	615	989	1 173	863	415	**10 842**
Soybean Flours and Meals/ Textured Vegetable Protein	**0**	0	0	0	0	0	0	197	273	541	355	382	**1 748**
Soybean Fullfat	**4 904**	283	335	315	862	375	460	508	662	579	594	1 200	**6 173**
Peanut Butter and Paste	**345**	22	109	103	131	128	5	40	47	129	32	35	**781**
Total	**82 628**	**7 441**	**8 327**	**7 613**	**5 460**	**5 186**	**5 354**	**3 898**	**5 626**	**5 667**	**4 535**	**4 797**	**63 904**

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.

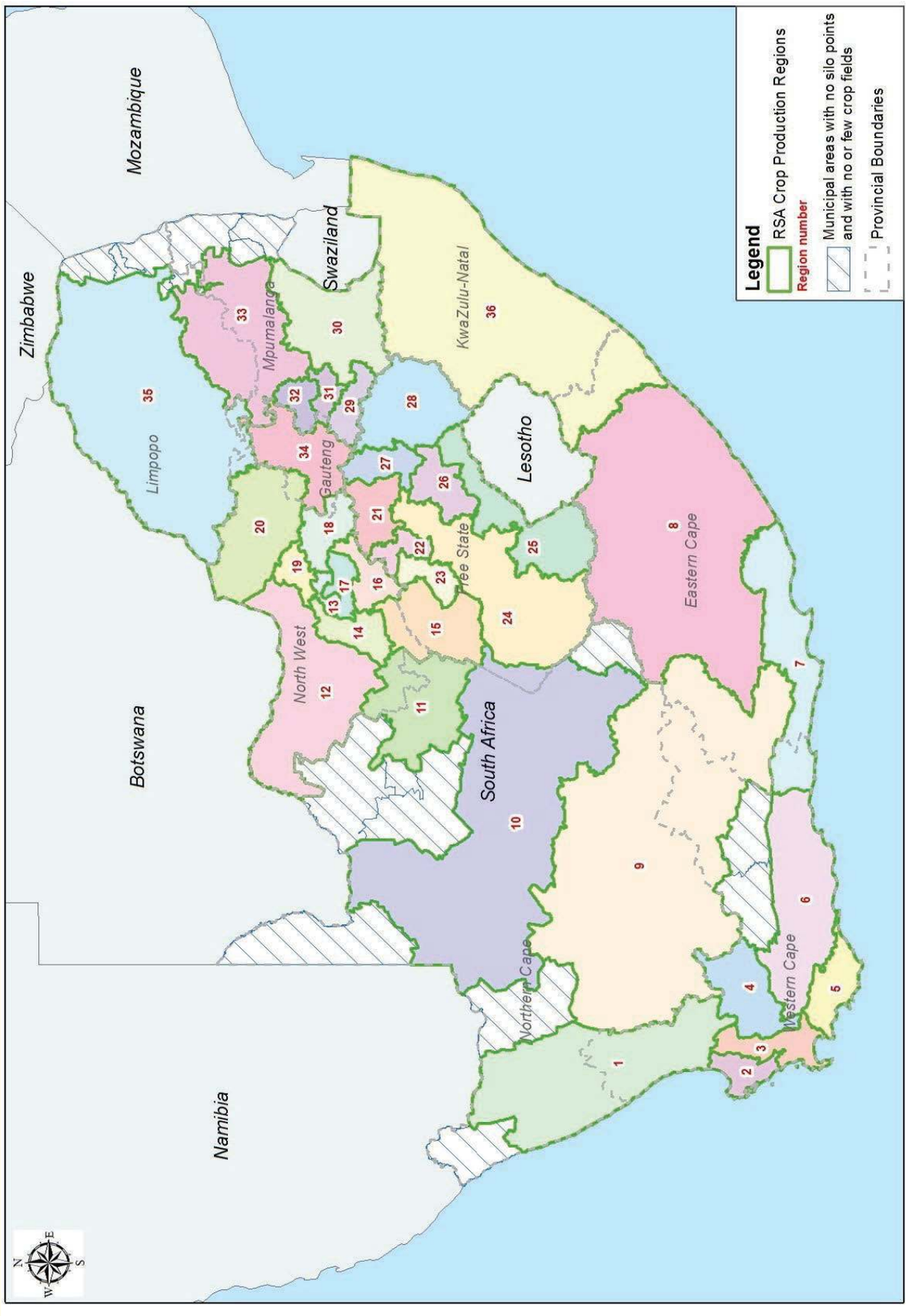
The 9 provinces are divided into 36 grain production regions.

The regions are distributed as follows:
Region 1: Namakwaland
Regions 2 to 4: Swartland
Regions 5 and 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 2017/2018 production season, are named and described on pages 20 to 26 (in the header of the quality data per region tables.) The silo/intake stands per region 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.

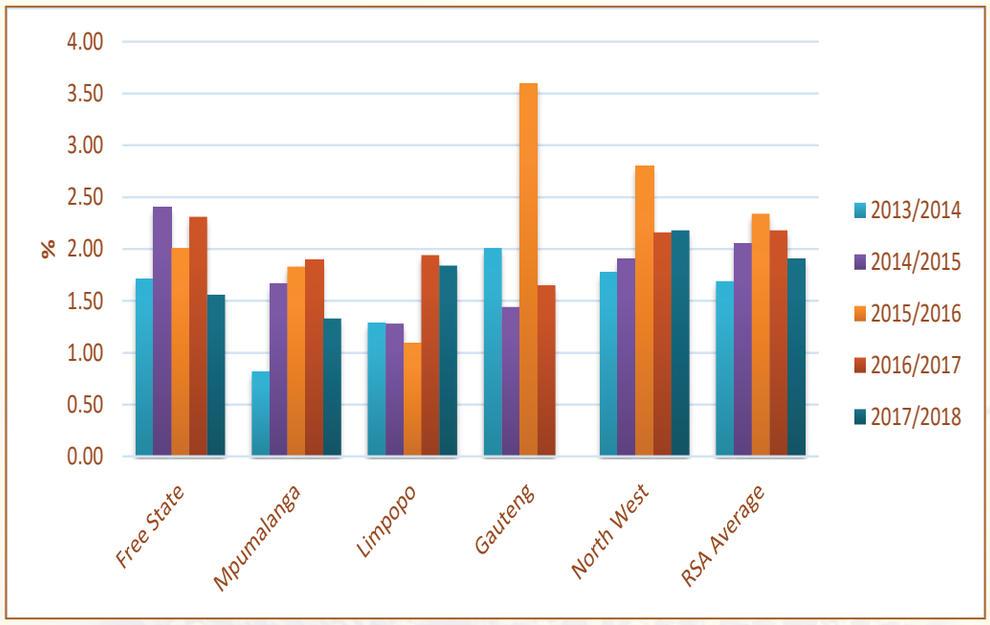
Sunflower Crop Quality 2017/2018 – Summary of results

Eighty-one percent (143) of the 176 samples analysed for the purpose of this survey were graded as Grade FH1, with 33 of the samples downgraded to COSF (Class Other Sunflower Seed). The percentage of FH1 samples decreased compared to the 85% of the previous season. In the 2015/2016 season, this percentage was 78%.

- Eighteen 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.
- Eight samples were downgraded as a result of the presence of poisonous seeds (*Datura spp or Crotalaria spp.*) exceeding the maximum permissible number, namely 1 per 1000 g.
- One sample was downgraded as a result of the presence of poisonous seeds (*Xanthium strumarium*) exceeding the maximum permissible number, namely 7 per 1000 g.
- The remaining six samples were downgraded as a result of a combination of one or more of the following deviations exceeding the maximum permissible deviation: percentage screenings, percentage foreign matter, percentage collective deviations as well as the presence of poisonous seeds or an undesired odour.

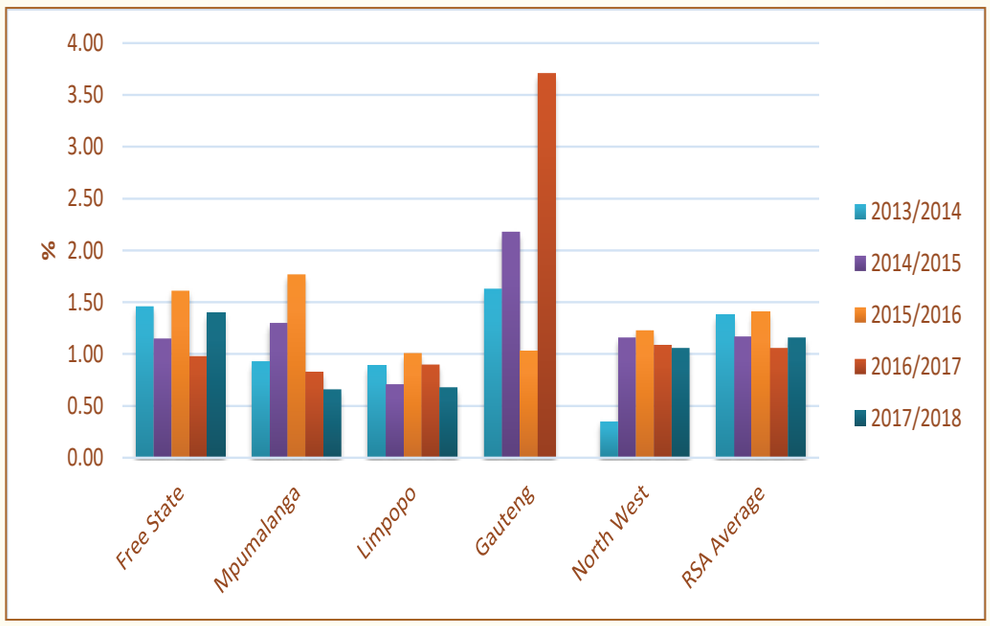
North West province (99 samples) reported the highest weighted average percentage screenings namely 2.18%, followed by Limpopo (N = 5) and Free State (N = 64) provinces with 1.84% and 1.56% respectively. Mpumalanga (8 samples) reported the lowest average percentage screenings of 1.33%. The weighted national average was 1.91% compared to the 2.18% of the previous season. No samples were received from Gauteng province this season.

Graph 16: Average percentage screenings per province over five seasons



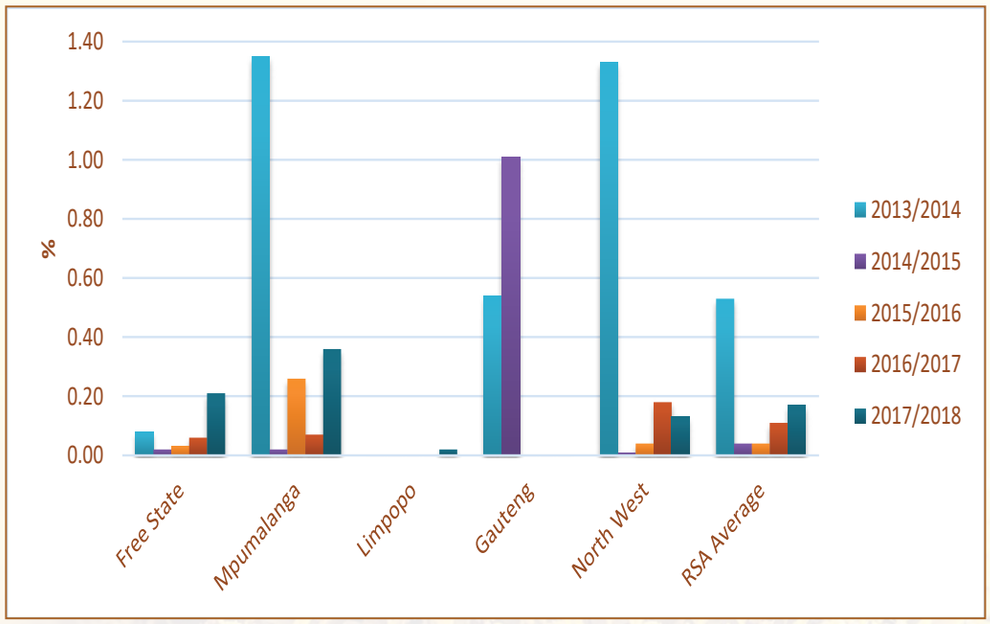
The highest weighted percentage foreign matter (1.40%) was reported on the samples from the Free State. North West averaged 1.06% and the lowest percentages were found in Limpopo and Mpumalanga with 0.68% and 0.66% respectively. The South African average was 1.16% compared to the 1.06% and 1.41% of the previous two seasons.

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



The number of samples received for this survey that contained sclerotia from the fungus *Sclerotinia sclerotiorum*, almost tripled from 28 samples (16%) in the previous season, to 78 samples (44%) this season. Forty-one of these samples originated in the North West province, 28 in the Free State, eight in Mpumalanga and one in Limpopo. None of these samples however exceeded the maximum permissible deviation of 4%. Weighted average levels ranged from 0.02% in Limpopo to 0.36% in Mpumalanga. The national average of 0.17% was slightly higher than the 0.11% of the previous season.

Graph 18: Average percentage sclerotia per province over five seasons

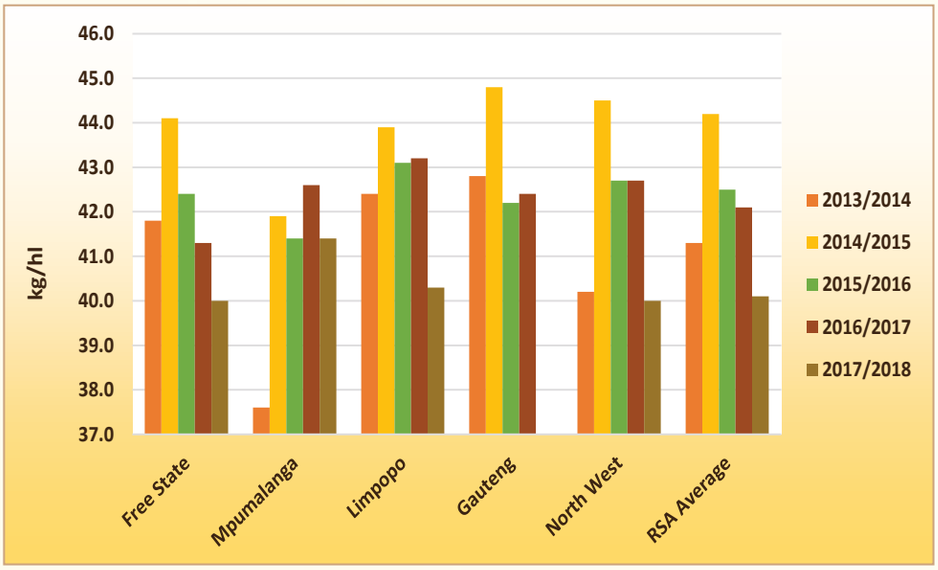


Test weight does not form part of the grading regulations for sunflower seed in South Africa. An approximation of the test weight of South African sunflower seed is provided in Table 3 for information purposes. The standard working procedure of the Kern 222 instrument, as described in ISO 7971-3:2009, was followed. The g/1 L filling mass of the sunflower seed samples was determined and divided by two. The test weight was then 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 also see Graph 19 for a comparison of the test weight per province over the last five seasons.

Table 3: Approximation of test weight per province over three seasons									
Province	Test weight, kg/hl								
	2017/2018 Season			2016/2017 Season			2015/2016 Season		
	Weighted average	Range	No. of samples	Weighted average	Range	No. of samples	Weighted average	Range	No. of samples
Free State (Regions 21 - 28)	40.0	34.9 - 45.7	64	41.3	34.2 - 45.1	76	42.4	36.3 - 48.1	80
Mpumalanga (Regions 29 - 33)	41.4	35.0 - 42.2	8	42.6	35.0 - 42.2	10	41.4	35.0 - 42.2	7
Limpopo (Region 35)	40.3	38.5 - 43.1	5	43.2	40.4 - 45.5	11	43.1	42.7 - 43.8	7
Gauteng (Region 34)	-	-	-	42.4	41.2 - 43.7	3	42.2	41.7 - 42.8	2
North West (Region 12 - 20)	40.0	33.2 - 45.9	*98	42.7	39.1 - 45.1	76	42.7	40.0 - 46.2	80
RSA	***40.1***	***33.2 - 45.9***	***175***	***42.1***	***34.2 - 45.5***	***176***	***42.5***	***35.0 - 48.1***	***176***

*One sample with an outlier value was not taken into account for calculation purposes.

Graph 19: Comparison of the test weight per province over five 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.

The weighted average crude protein content this season was 16.61%, similar to the 16.63% of the previous season. North West had the highest weighted average crude protein content of 17.12% and Mpumalanga the lowest with 15.15%. Mpumalanga has consistently reported the lowest average protein content since commencement of this survey in the 2012/2013 season. Limpopo's crude protein content averaged 16.95% and that of the Free State 15.97%. The weighted average crude fat percentage of 37.0% was the lowest of the last six seasons and 1.6% lower than the previous season. Mpumalanga had the highest weighted average crude fat content of 40.0%. Last season Mpumalanga also reported the highest fat content. The lowest average fat content was the 36.1% of the North West province (also the lowest in the previous season).

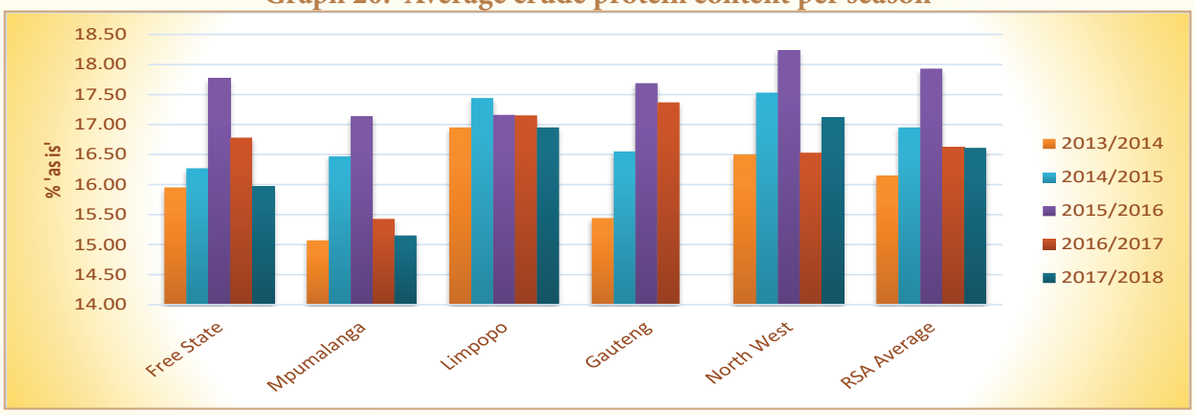
The weighted average percentage crude fibre is the highest of the six seasons at 21.9% (21.0% in 2016/2017). Average values varied between 20.2% in Limpopo to 22.2% in the Free State. The weighted average ash content is also the highest over six seasons (2.69%), last season 2.52%. The provincial averages ranged from 2.56% in Mpumalanga to 2.74% in Limpopo.

Graphs 20 to 23 on page 18 provide comparisons between provinces for the nutritional components discussed above.

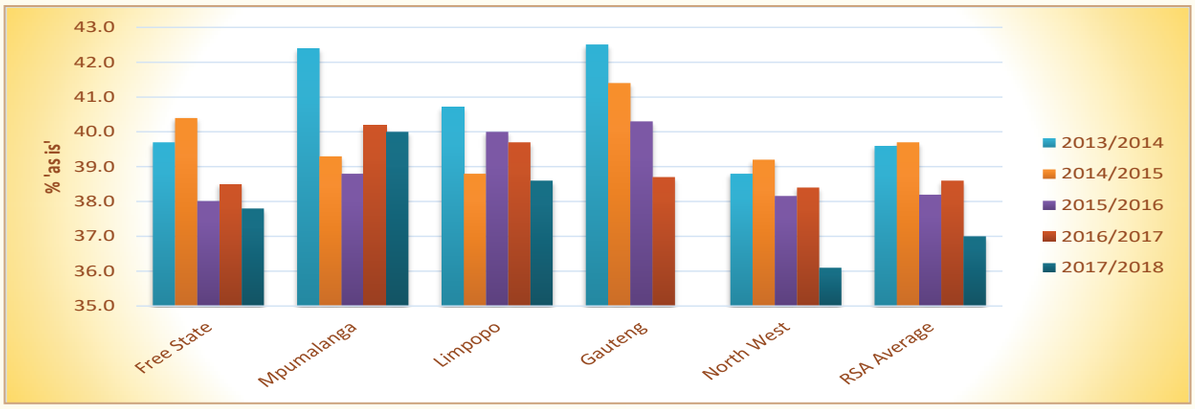
See Table 4 on page 19 for a summary of the RSA Sunflower Crop Quality averages of the 2017/2018 season compared to those of the 2016/2017 season.

Please also see pages 20 to 26 for the average sunflower quality per region.

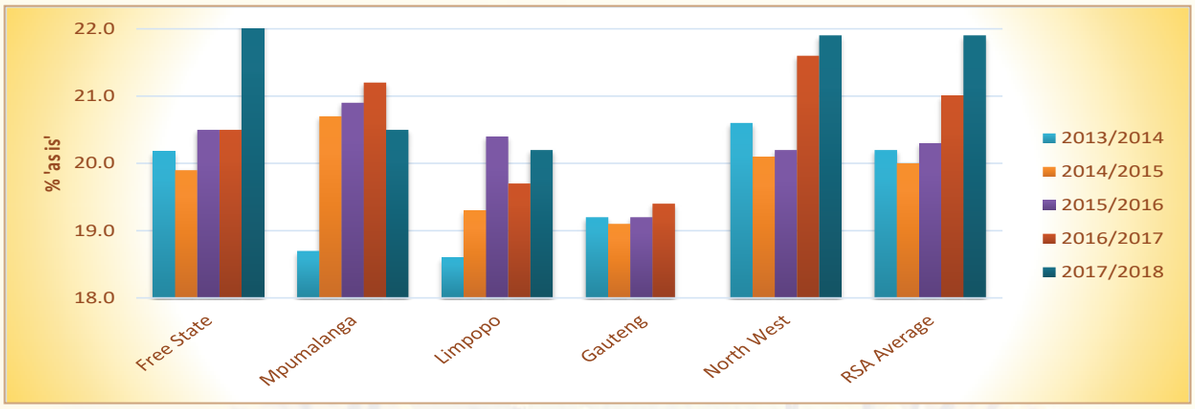
Graph 20: Average crude protein content per season



Graph 21: Average crude fat content per season



Graph 22: Average crude fibre content per season



Graph 23: Average ash content per season

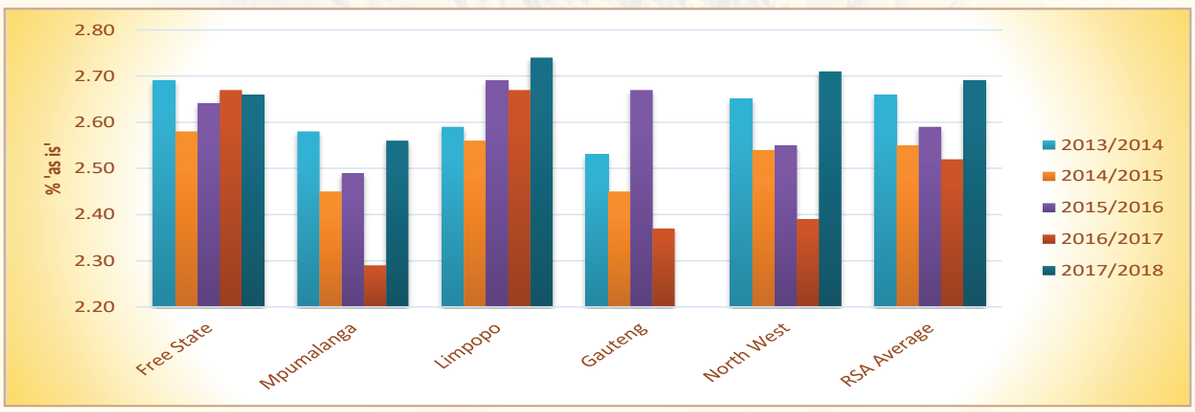


Table 4: South African Sunflower Crop Quality Averages 2017/2018 vs 2016/2017						
Class and Grade Sunflower	**2017/2018**			**2016/2017**		
	FH1	**COSF**	**Average**	**FH1**	**COSF**	**Average**
Grading:						
1. Damaged sunflower seed, %	0.32	0.25	0.31	0.40	4.39	0.99
2. Screenings, %	1.52	3.58	1.91	1.73	4.78	2.18
3. Sclerotia, %	0.14	0.29	0.17	0.06	0.38	0.11
4. Foreign Matter, %	0.97	1.94	1.16	1.01	1.35	1.06
5. Deviations in 2,3 and 4 collectively, %: Provided that such deviations are individually within the limits of said items	2.63	5.81	3.23	2.80	6.52	3.35
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
Poisonous seeds (*Crotalaria sp., Datura sp., Ricinis communis*)	0	6	1	0	0	0
Poisonous seeds (*Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.*)	0	1	0	0	0	0
Number of samples	***143***	***33***	***176***	***150***	***26***	***176***
Nutritional analysis:						
Moisture, % (5 hr, 105 °C)	4.9	4.8	4.9	4.8	4.7	4.8
Crude Protein, % (as is)	16.62	16.58	16.61	16.57	17.02	16.63
Crude Fat, % (as is)	36.9	37.2	37.0	38.7	38.5	38.6
Crude Fibre, % (as is)	21.9	22.0	21.9	21.0	21.0	21.0
Ash, % (as is)	2.68	2.71	2.69	2.52	2.56	2.52
Number of samples	***143***	***33***	***176***	***150***	***26***	***176***

SOUTH AFRICAN

REGIONAL SUNFLOWER QUALITY

PRODUCTION REGION	(12) North-West Western Region				(13) North-West Central Region (Sannieshof)				(14) 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) Schweizer-Reneke (Bins) Taaibospan (Bins)			
Grading:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
1. Damaged sunflower seed, %	0.13	0.00	0.64	0.23	0.03	0.00	0.24	0.08	0.00	0.00	0.00	0.00
2. Screenings, %	2.62	0.10	8.84	3.08	3.26	1.24	5.52	1.56	2.19	0.26	6.26	1.70
3. Sclerotia, %	0.04	0.00	0.30	0.11	0.13	0.00	0.40	0.16	0.05	0.00	0.22	0.08
4. Foreign Matter, %	0.53	0.20	1.16	0.29	1.63	0.10	3.50	1.13	0.80	0.32	1.74	0.36
5. Deviations in 2,3 and 4 collectively, %: Provided that such deviations are individually within the limits of said items	3.19	0.42	9.74	3.15	5.02	2.12	6.96	1.65	3.04	0.80	7.54	1.91
Poisonous seeds *(Crotalaria sp., Datura sp., Ricinis communis)*	0	0	0	0	0	0	0	0	1	0	10	2.72
Poisonous 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	***8***				***9***				***26***			
Nutritional analysis:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
Moisture, % (5 hr, 105 °C)	4.9	3.3	5.5	0.79	5.1	4.6	5.9	0.47	4.9	3.8	5.9	0.54
Crude Protein, % (as is)	17.54	16.45	19.81	1.07	17.15	14.00	19.77	1.62	16.73	14.76	18.53	1.05
Crude Fat, % (as is)	36.2	33.8	38.1	1.65	35.9	32.1	38.6	1.97	35.5	31.3	38.6	1.84
Crude Fibre, % (as is)	22.0	19.5	24.2	1.49	22.2	20.3	24.1	1.26	21.9	20.1	25.0	1.11
Ash, % (as is)	2.66	2.50	3.12	0.21	2.64	2.40	2.89	0.19	2.77	2.40	3.04	0.19
Number of samples	***8***				***9***				***26***			

SOUTH AFRICAN

REGIONAL SUNFLOWER QUALITY

PRODUCTION REGION	(15) North-West South-Eastern Region				(16) North-West Central Eastern Region				(17) 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) Klerksdorp (Bins) Leeudoringstad (Bins) Makwassie (Bins) Regina (Bins) Strydpoort (Bins) Wolmaranstad (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. Damaged sunflower seed, %	0.03	0.00	0.20	0.07	0.04	0.00	0.16	0.06	0.14	0.00	0.86	0.27
2. Screenings, %	0.88	0.20	1.70	0.43	1.48	0.18	6.88	1.83	2.34	0.86	3.36	0.70
3. Sclerotia, %	0.12	0.00	0.76	0.25	0.45	0.00	1.60	0.52	0.17	0.00	0.60	0.15
4. Foreign Matter, %	0.90	0.24	1.62	0.48	0.85	0.16	1.86	0.63	1.19	0.30	2.04	0.41
5. Deviations in 2,3 and 4 collectively, %: Provided that such deviations are individually within the limits of said items	1.90	1.20	2.90	0.53	2.78	0.36	8.82	2.13	3.70	2.20	4.98	0.82
Poisonous seeds *(Crotalaria sp., Datura sp., Ricinis communis)*	2	0	20	6.67	1	0	10	2.77	1	0	20	5.16
Poisonous 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***				***13***				***15***			
Nutritional analysis:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
Moisture, % (5 hr, 105 °C)	5.2	4.3	5.6	0.45	4.7	4.1	5.2	0.33	4.9	4.3	6.2	0.59
Crude Protein, % (as is)	18.24	16.44	20.09	1.15	17.22	15.55	18.59	0.78	17.49	15.98	19.28	0.99
Crude Fat, % (as is)	35.3	29.9	41.0	3.27	36.5	31.8	39.5	2.21	36.9	34.1	42.2	1.92
Crude Fibre, % (as is)	21.9	18.5	26.8	2.39	21.3	19.0	23.3	1.27	22.1	20.3	24.1	1.20
Ash, % (as is)	2.89	2.68	3.48	0.25	2.67	2.39	3.05	0.20	2.63	2.38	2.88	0.14
Number of samples	***9***				***13***				***15***			

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) Lichtenburg (Bins/Bunkers) Lottie Halte (Bins) Lusthof (Bins) Mafikeng (Bins)				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. Damaged sunflower seed, %	1.60	0.00	9.35	3.80	0.25	0.00	1.60	0.55	0.11	0.00	0.56	0.25
2. Screenings, %	1.81	0.38	2.70	0.79	1.59	0.72	2.92	0.70	4.64	2.30	8.16	2.43
3. Sclerotia, %	0.00	0.00	0.00	0.00	0.06	0.00	0.22	0.08	0.12	0.00	0.44	0.19
4. Foreign Matter, %	0.87	0.30	2.60	0.88	1.71	0.60	3.34	1.15	1.93	0.94	3.96	1.17
5. Deviations in 2,3 and 4 collectively, %: Provided that such deviations are individually within the limits of said items	2.68	1.32	5.30	1.36	3.36	1.72	5.34	1.73	6.69	3.94	9.76	2.12
Poisonous seeds *(Crotalaria sp., Datura sp., Ricinis communis)*	0	0	0	0	3	0	20	7.07	2	0	10	4.47
Poisonous seeds *(Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.)*	0	0	0	0	3	0	20	7.07	0	0	0	0
Number of samples	***6***				***8***				***5***			
Nutritional analysis:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
Moisture, % (5 hr, 105 °C)	5.2	4.1	6.8	1.03	5.4	4.0	7.1	1.14	4.9	3.8	5.9	0.81
Crude Protein, % (as is)	16.52	14.73	17.94	1.20	16.53	12.40	18.15	1.77	16.76	13.79	19.16	2.19
Crude Fat, % (as is)	36.1	33.6	38.4	1.91	36.7	31.0	42.4	3.09	36.7	35.2	37.5	0.96
Crude Fibre, % (as is)	21.8	20.4	23.8	1.35	22.7	20.8	25.5	1.37	21.4	18.6	24.0	2.29
Ash, % (as is)	2.69	2.55	2.83	0.11	2.72	2.52	2.89	0.11	2.67	2.44	2.87	0.17
Number of samples	***6***				***8***				***5***			

SOUTH AFRICAN

REGIONAL SUNFLOWER QUALITY

PRODUCTION REGION	(21) Free State North-Western Region (Viljoenskroon)				(22) Free State North-Western Region (Bothaville)				(23) Free State North-Western Region (Bultfontein)			
Silo/Intake stands (Type of storage)	Attie (Bins) Groenebloem (Bins) Heuningspruit (Bins) Kommandonek (Bunkers) Koppies (Bins) Rooiwal (Bins) Vierfontein (Bins) Viljoenskroon (Bins) Vredefort (Bins) Weiveld (Bins)				Allanridge (Bins) Bothaville (Bins) Mirage (Bins) Misgunst (Bunkers) Odendaalsrus (Bins) Schoonspruit (Bins) Schuttesdraai (Bins)				Bultfontein (Bins) Kaalplaas (Bins) Losdoorns (Bins) Protespan (Bins) Tierfontein (Bins) Wesselsbron (Bins) Willemsrust (Bins)			
Grading:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
1. Damaged sunflower seed, %	0.18	0.00	0.78	0.26	0.00	0.00	0.00	0.00	0.39	0.00	1.60	0.64
2. Screenings, %	1.81	1.24	2.54	0.48	1.09	0.26	2.00	0.87	1.32	0.40	1.60	0.38
3. Sclerotia, %	0.21	0.00	1.34	0.47	0.00	0.00	0.00	0.00	0.01	0.00	0.08	0.03
4. Foreign Matter, %	0.70	0.10	1.72	0.60	0.89	0.24	1.30	0.57	0.95	0.34	1.82	0.53
5. Deviations in 2,3 and 4 collectively, %: Provided that such deviations are individually within the limits of said items	2.72	1.66	3.98	0.77	1.98	0.50	3.14	1.35	2.28	0.84	3.28	0.80
Poisonous seeds *(Crotalaria sp., Datura sp., Ricinis communis)*	0	0	0	0	0	0	0	0	2	0	20	6.67
Poisonous 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	***8***				***3***				***9***			
Nutritional analysis:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
Moisture, % (5 hr, 105 °C)	4.5	3.8	5.3	0.49	4.5	4.1	4.7	0.32	5.1	4.0	5.8	0.62
Crude Protein, % (as is)	16.57	15.21	17.60	0.82	16.40	15.34	16.94	0.92	18.55	17.48	19.93	0.83
Crude Fat, % (as is)	39.6	37.5	42.1	1.56	39.7	38.2	41.6	1.75	34.8	28.3	43.2	4.49
Crude Fibre, % (as is)	20.7	19.6	21.9	0.75	20.9	20.4	21.7	0.68	21.9	17.8	23.9	1.90
Ash, % (as is)	2.71	2.47	2.97	0.16	2.60	2.54	2.65	0.06	2.86	2.66	3.24	0.21
Number of samples	***8***				***3***				***9***			

SOUTH AFRICAN

REGIONAL SUNFLOWER QUALITY

PRODUCTION REGION	(24) Free State Central Region	(26) Free State South-Eastern Region	(27) Free State Northern Region
Silo/Intake stands (Type of storage)	Bainsvlei (Bins) Bloemfontein (Bins) Brandfort (Bins) De Brug (Bins) Geneva (Bins) Hennenman (Bins) Kroonstad (Bins) Petrusburg (Bins) Theunissen (Bins) Van Tonder (Bins) Welgeleë (Bins) Winburg (Bins)	Arlington (Bins) Kaallaagte (Bins) Libertas (Bins) Marquard (Bins) Meets (Bins) Monte Video (Bins) Senekal (Bins) Steynsrus (Bins) Tweespruit (Bins) Westminster (Bins)	Gottenburg (Bins) Heilbron (Bins) Hoogte Grainlink (Bins) Mooigeleë (Bins) Petrus Steyn (Bins) Wolwehoek (Bins)

Grading:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
1. Damaged sunflower seed, %	0.55	0.00	2.80	0.90	0.85	0.00	5.12	1.38	0.78	0.00	1.22	0.57
2. Screenings, %	1.62	0.10	2.52	0.80	1.35	0.36	4.40	1.13	2.95	1.66	5.10	1.49
3. Sclerotia, %	0.05	0.00	0.44	0.13	0.40	0.00	2.04	0.46	0.08	0.00	0.16	0.09
4. Foreign Matter, %	1.38	0.76	3.20	0.64	1.77	0.30	12.00	2.26	2.27	1.40	3.56	0.95
5. Deviations in 2,3 and 4 collectively, %: Provided that such deviations are individually within the limits of said items	3.05	1.20	5.06	1.19	3.52	1.30	13.80	2.67	5.29	3.92	6.84	1.46
Poisonous seeds *(Crotalaria sp., Datura sp., Ricinis communis)*	0	0	0	0	1	0	10	3.26	5	0	20	10.00
Poisonous 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	***12***				***26***				***4***			
Nutritional analysis:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
Moisture, % (5 hr, 105 °C)	5.2	4.6	5.9	0.41	4.6	3.7	5.3	0.38	4.6	3.9	5.3	0.57
Crude Protein, % (as is)	16.30	14.88	17.77	0.76	14.92	12.72	17.08	1.14	14.61	13.43	16.99	1.62
Crude Fat, % (as is)	35.4	30.6	38.0	2.09	38.9	35.2	42.0	1.70	39.2	38.2	40.1	0.80
Crude Fibre, % (as is)	22.5	19.3	24.5	1.59	22.8	20.2	25.9	1.52	22.4	20.6	24.0	1.39
Ash, % (as is)	2.65	2.43	2.98	0.13	2.62	2.48	2.80	0.10	2.49	2.17	2.68	0.22
Number of samples	***12***				***26***				***4***			

SOUTH AFRICAN

REGIONAL SUNFLOWER QUALITY

PRODUCTION REGION	(28) Free State Eastern Region				(29) Mpumalanga Southern Region				(33) Mpumalanga Northern Region			
Silo/Intake stands (Type of storage)	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)				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. Damaged sunflower seed, %	0.00	0.00	0.00	0.00	0.05	0.00	0.16	0.08	0.24	-	-	-
2. Screenings, %	1.82	0.60	3.04	1.73	1.17	0.28	3.20	0.99	2.46	-	-	-
3. Sclerotia, %	0.04	0.00	0.08	0.06	0.32	0.08	1.08	0.36	0.60	-	-	-
4. Foreign Matter, %	0.52	0.42	0.62	0.14	0.66	0.08	1.60	0.64	0.66	-	-	-
5. Deviations in 2,3 and 4 collectively, %: Provided that such deviations are individually within the limits of said items	2.38	1.10	3.66	1.81	2.15	0.60	3.66	1.11	3.72	-	-	-
Poisonous seeds *(Crotalaria sp., Datura sp., Ricinis communis)*	0	0	0	0	0	0	0	0	0	-	-	-
Poisonous 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	***2***				***7***				***1***			
Nutritional analysis:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
Moisture, % (5 hr, 105 °C)	4.5	4.2	4.7	0.35	4.5	4.1	4.8	0.25	4.4	-	-	-
Crude Protein, % (as is)	15.84	15.64	16.04	0.28	15.24	13.49	16.49	1.07	14.49	-	-	-
Crude Fat, % (as is)	38.6	37.7	39.5	1.27	40.0	39.3	40.9	0.59	40.2	-	-	-
Crude Fibre, % (as is)	20.8	19.7	21.8	1.48	20.4	19.2	21.7	0.76	21.0	-	-	-
Ash, % (as is)	2.62	2.57	2.66	0.06	2.59	2.40	2.72	0.14	2.35	-	-	-
Number of samples	***2***				***7***				***1***			

SOUTH AFRICAN

REGIONAL SUNFLOWER QUALITY

PRODUCTION REGION	(35) Limpopo
Silo/Intake stands (Type of storage)	Alma (Bins) Lehau (Bins) Naboomspruit (Mookgophong) (Bins) Nylstroom (Modimolle) (Bins) Nutfield (Bins) Potgietersrus (Mokopane) (Bins) Roedtan (Bins) Settlers (Bins) Warmbad (Bela-Bela) (Bins)

Grading:	***ave***	***min***	***max***	***stdev***
1. Damaged sunflower seed, %	0.12	0.00	0.34	0.16
2. Screenings, %	1.84	0.60	3.60	1.49
3. Sclerotia, %	0.02	0.00	0.10	0.04
4. Foreign Matter, %	0.68	0.34	0.94	0.27
5. Deviations in 2,3 and 4 collectively, %: Provided that such deviations are individually within the limits of said items	2.54	1.44	3.94	1.22
Poisonous seeds *(Crotalaria sp., Datura sp., Ricinis communis)*	8	0	30	13.01
Poisonous seeds *(Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.)*	0	0	0	0.00
Number of samples	***5***			

Nutritional analysis:	***ave***	***min***	***max***	***stdev***
Moisture, % (5 hr, 105 °C)	4.5	3.2	5.4	0.81
Crude Protein, % (as is)	16.95	14.55	19.89	2.17
Crude Fat, % (as is)	38.6	34.1	42.2	3.17
Crude Fibre, % (as is)	20.2	15.9	23.6	2.95
Ash, % (as is)	2.74	2.64	2.94	0.12
Number of samples	***5***			

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, per silo bin at each silo.

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.

If there were more than one container per class and grade per silo bin, 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 (Government Notice NO. 45 of 22 January 2016).

See pages 58 to 65 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 seed in South Africa. An approximation of the test weight of South African sunflower seed is provided in this report for information purposes. The standard working procedure of the Kern 222 instrument, as described in ISO 7971-3:2009, was followed. The g/1 L filling mass of the sunflower seed samples was determined and divided by two. The test weight was then 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).

NUTRITIONAL ANALYSIS:

Milling

Prior to the chemical analyses, the sunflower seed 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.

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.

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.

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:

South African Grain Laboratory (NPC)
Agri-Hub Office Park - Grain Building
477 Witherite Road
The Willows
Pretoria
0040

Technical Signatories:

Ms J Nortje (All Methods excl. In-house method 029)
Ms M Bothma (All Chemical Methods)
Ms M Hammes (All Chemical Methods)
Ms A de Jager (Nutrients & Contaminants Methods)
Ms W Louw (In-house Methods 001, 002, 003, 010 & 026)
Ms D Moleke (Rheological Methods)
Ms I Terblanche (Rheological Methods)
Ms H Meyer (All Chemical, Nutrients and Contaminants & Grading Methods)
Ms J Kruger (All Chemical Methods)
Ms P Modiba (All Chemical Methods)
Ms M Motlanthe (In-house Methods 001, 003 & 026)
Mr B van Der Linde (Grading)
Ms M Ramare (All Chemical Methods Excl. In-House Method 012 and SOP MC23)
Ms Z Skhosana (In-house Method 026)
Ms T de Beer (Rheological Methods)

Postal Address:

Postnet Suite # 391
Private Bag X1
The Willows
0041

Tel: (012) 807-4019
Fax: N/A
E-mail: Paulina.Modiba@sagl.co.za

Nominated Representative:

Ms PM Modiba

Issue No.: 28
Date of Issue: 20 December 2018
Expiry Date: 31 October 2019

Material or Products Tested	Type of Tests / Properties Measured, Range of Measurement	Standard Specifications, Techniques / Equipment Used
CHEMICAL		
Ground Barley	Moisture (Oven Method)	Analytical EBC Method 3.2, latest Edition (2 hour; 130^{0}C)
Cereal and cereal products specifically-wheat, rice, (hulled paddy), barley, millet, rye, and oats as grain, 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	Moisture (Oven Method)	AACCI 44-15.02, Latest Edition (1 hour; 130˚C)

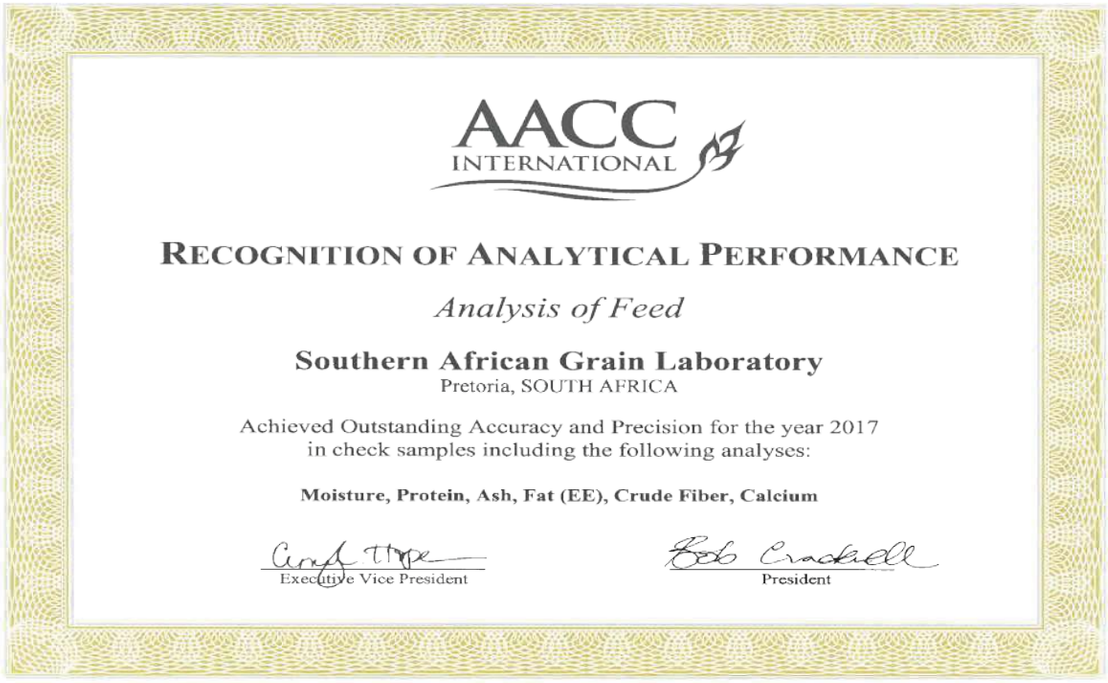
are sugar coated)		(72 hour; 103˚C)
Maize Grits	Moisture (Oven Method)	Analytical EBC Method 6.2.2, latest edition (4 hours, 130^{0}C)
Animal feed, Plant tissue and Sunflower (Milled)	Moisture (Oven Method)	AgriLASA 2.1, Latest Edition (5 hours, 105^{0}C)
All flours, cereal grains, oilseeds and animal feeds	Nitrogen and protein (Combustion method - Dumas)	AACCI 46-30.01, Latest Edition
Cereal based food stuff	Dietary fibres (Total)	In-house method 012
Food stuff and feeds	Carbohydrates (by difference) (calculation) Energy value (calculation) Total digestible nutritional value (calculation)	SOP MC 23
Food Stuff and feeds	Determination of Ash	In-house method 011
Wheat Kernels	Moisture (Oven Method)	Government Gazette Wheat Regulation, Latest Edition (72 hour, 103˚C)
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 Std 107/1, Latest Edition
NUTRIENTS AND CONTAMINANTS		
Vitamin fortified food and feed products and fortification mixes grain based	Vitamin A as all trans Retinol (Saponification) (HPLC)	In-house method 001
	Thiamine Mononitrate (HPLC) Riboflavin (HPLC) Nicotinamide (HPLC) Pyridoxine Hydrochloride (HPLC)	In-house method 002
	Folic Acid (HPLC)	In-house method 003
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
Yeast and Bread	Vitamin D_2 (HPLC)	In-House method 029

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 Std.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

ISSUED BY THE SOUTH AFRICAN NATIONAL ACCREDITATION SYSTEM

Accreditation 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 2017
in check samples including the following analyses:

Moisture, Protein, Ash, Fat (EE), Crude Fiber, Calcium

Executive Vice President

President

AGRILASA

AGRILABORATORY ASSOCIATION OF SOUTHERN AFRICA
AGRILABORATORIUM ASSOSIASIE VAN SUIDELIKE AFRIKA

CERTIFICATE
OF
PARTICIPATION

This serves to confirm that

SOUTH AFRICAN GRAIN LABORATORY

is actively participating in the

FEEDS

discipline of the AgriLASA PT Scheme for
Cycle One of 2018/2019.

Report

Evaluation of sunflower cultivars: 2017/2018 season

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

Table of Contents

List of Tables

List of Figures

INTRODUCTION

Optimisation of crop production requires, among a number of inputs, the selection of a well performing cultivar. Sunflower cultivar trials, which are done since the nineteen seventies in South Africa, have the aim to enable farmers to optimise sunflower production through sound cultivar selection.

In this project, commercially available cultivars are evaluated in order to predict their future yield performances and to assess their seed composition. This project is the only unbiased effort in South Africa that strives to evaluate important cultivars in the main areas of production. The information generated in these 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 2017/2018 season with the voluntary collaboration of Agricol, Pannar, Pioneer, Syngenta and AGT. Seed companies entered 19 cultivars for evaluation (Table 1) and supplied seed to the ARC-GC 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 (Senwes Grainlink). 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.

Eight of the 19 cultivars were Clearfield types on which the use of the post emergence broad leaf weed controlling herbicide mixture, imazapyr + imazamox (Euro-Lightning®), is possible. In the field trials these cultivars were treated in the same way as the regular cultivars and received no Euro-Lightning®. One hybrid (PAN 7158 HO) of the 19 was high oleic acid.

Each collaborating seed company had to conduct at least one trial for each cultivar entry. Agricol was supplied with seed for 8 trials, Pannar with 6, Pioneer with 4 and Syngenta with 1. Five trials were planted by the ARC-GC with different planting dates. Trial sites were selected by collaborators and the co-workers involved are listed in Table 2.

Ten trials of Pannar and Pioneer were not planted due to technical issues within the company, two trials were not successful due to late planting and sclerotinia, bird damage, replanting not harvested or even not planted. Planting dates, amount of fertiliser applied, soil analyses and other agronomic details from some successful field trials are reported in Table 3. Grain yields were recorded on these trials while the period from planting to 50% flowering was recorded on five trials at Potchefstroom and two trials at Boskop and one trial at Ventersdorp, Rysmierbult ,Lichtenburg, Viljoenskroon, and Senekal,

Yield data and seed samples were send by collaborators to ARC-GC for analyses. Seed from selected trials sent to SAGL for oil and protein content analyses. Yield data from 12 field trials were subjected to analyses of variance. The regression line technique as described by Loubser and Grimbeek (1984) was used to calculate yield probabilities for cultivars at different yield potentials from the 12 trials.

Yield probabilities were also calculated for 12 cultivars that were evaluated in 25 trials during 2016/2017 and 2017/2018.

RESULTS

Days from planting to flowering

The mean number of days from planting to 50% flowering of cultivars (Table 4) ranged from 68 (PAN 7102 CLP, PHB 65A70 and AGSUN 5270) to 72 days (AGSUN 5103 CLP, P 65 LL 02, PAN 7158 HO , AGSUN 5106 CLP and SY 3970 CL). Calculated across cultivars and planting dates, the period from planting to flowering was 70 days.

Oil and protein concentration

The moisture free oil and protein concentrations of seed from seven 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 moisture free oil content for cultivars at the various localities varied from 38.84 to 49.44% with an overall mean of 41.58%.

The highest mean oil concentration among localities was at Potchefstroom (planting date 20 October 2017) with 47.32%. The locality with the lowest mean oil content of 33.28% was Senekal planting date was January 28, 2018. The highest oil concentration among

cultivars and calculated across localities, was SY 3970 CL at 49.44% followed by P 65 LL 02 at 44.99%

The average protein content varied from 16.73 to 19.8% among cultivars at the different localities. Among localities, Potchefstroom planted in January 24, 2018 had the highest and Potchefstroom planted in October 20, 2017 the lowest protein content of 24.05 and 15.84% respectively. Calculated across localities, AGSUN 5101 CLP had the highest protein content (19.80 %) followed by AGSUN 5103 CLP and AGSUN 8251(19.5) while PAN 7156 CLP the lowest (16.63%).

Seed yield

The mean seed yield of cultivars at the respective localities is presented in Table 7. The highest locality mean yield of 3.39 t ha^{-1} was obtained at Boskop2 planted on 12 December 2017 and the lowest of 1.32 t ha^{-1}, at Senekal planted on 28th January 2018.

The five best performing cultivars, in terms of average yield calculated over localities, were PAN 7160 CLP, P 65 LL02, PAN 7100, AGSUN 5272 and PAN 7156 CLP. The overall mean yield for 2017/18 was 2.38 t ha^{-1}, 6 % higher than the mean yield of 2016/17.

One high oleic cultivar (PAN 7158 HO) was entered for evaluation in 2017/2018. Eight Clearfield and Clearfield Plus cultivars, AGSUN 5101 CLP, AGSUN 5102 CLP, AGSUN 5103 CLP, AGSUN 5106 CLP, PAN 7102 CLP, PAN 7156 CLP, PAN 7160 CLP and SY 3970 CL were entered. Five of these cultivars namely, PAN 7160 CLP, PAN 7156 CLP, AGSUN 5103 CLP, AGSUN 5106 CLP and PAN 7102 CLP have yields higher than the overall mean yield of all cultivars.

Oil yield

Oil yield per unit area is the product of grain yield and seed oil content and presented in Table 8.

The oil yield for cultivars at the seven localities varied from 0.90 to 1.11 t ha-1 with an overall mean of 1.0 t ha-1. The locality with the highest mean oil yield was Boskop planted in December 12, 2017 at 1.53 t ha-1. P 65 LL 02 has the highest oil yield of 1.11 t ha-1 followed by PAN 7160 CLP with 1.10 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 the evaluation of individual trials.

Regression line coordinates at different yield targets

Regression line coordinates at different yield targets, the overall mean yield, the intercept and slope from the regression line and yield stability (D-parameter) are shown in Table 10. The coordinate values of a particular cultivar are estimates of the mean expected yield at corresponding yield potentials. These values take the cultivar X environment interaction into account but not the yield stability. These values are accordingly not reliable for cultivar selection. Individual cultivar regression lines for 2017/18 are shown in Figure 1 and for the 13 cultivars evaluated in 2016/17 and 2017/18 in Figure 2.

The yield stability of cultivars varied up to 21 fold among cultivars (Table 10). Cultivars which had exceptionally high stabilities (D-parameter ≤ 0.05) were, AGSUN 5102 CLP , PAN 70160 CLP, PAN 7100, AGSUN 5278, AGSUN 5273, AGSUN 5101 CLP, P 65LP 54, P 65 LL02, PAN 7102 CLP, AGSUN 5103 CLP, PAN 7102 CLP, AGSUN 5103 CLP and PAN 7080

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 19 cultivars for 2017/18 are shown in Table 11. It takes account of both the cultivar X environment interaction and the yield stability and is therefore a reliable measure for cultivar choice. Yield probabilities higher than or equal to 60% in Table 11 indicates which cultivars would be sensible choices at the various yield potentials.

The yield probabilities of 13 cultivars evaluated in 24 trials in 2016/17 and 2017/18, are shown in Table 12. Tables 11 and 12 should be used jointly for cultivar selection.

Acknowledgements

Funding from the Oil and Protein Seed Development Trust and the participation of Agricol, Pannar, Pioneer, Syngenta and AGT are gratefully acknowledged.

References

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

Table 1: Cultivars evaluated and seed germination rate and supplier company 2017/18

Cultivar's Name	Germinated (%)			
	Normal	Abnormal	Dormant/dead	Company
AGSUN 5101 CLP	100	0	0	Agricol
AGSUN 5102 CLP	96	1	3	
AGSUN 5103 CLP	98	1	1	
AGSUN 5106 CLP	98	1	1	
AGSUN 5270	97	1	2	
AGSUN 5273	100	0	0	
AGSUN 5278	98	0	2	
AGSUN 8251	95	0	5	
PAN 70160 CLP	99	0	1	Pannar
PAN 7080	99	1	0	
PAN 7100	98	2	0	
PAN 7102 CLP	98	1	1	
PAN 7156 CLP	97	3	0	
PAN 7158 HO	97	3	0	
P 65 LL 02	97	1	2	Pioneer
P 65 LL14	94	2	4	
P 65 LP 54	98	1	1	
PHB 65A70	95	4	1	
SY 3970 CL	97	2	1	Syngenta

Table 2: Collaborating company, trial localities and responsible co-workers 2017/18

Company	Localities	Planting dates	Co-workers	E-mail address of co-worker
Agricol	Boskop 1 Boskop 2 Ventersdorp Lichtenburg Rysmierbult Vilioenskroon	07/11/2017 12/12/2007 30/01/2018 01/12/2017 01/12/2017 02/01/2018	J Swanepoel	Jouberts@agricol.co.za
ARC-GCI	Potchefstroom	20/10/2017 08/11/2017 20/11/2017 04/12/2017 24/01/2018	W Makgoga & J Erasmus	Makgogamw@arc.agric.za Erasmusj@arc.agric.za
PANNAR			A Pretorius	abre.pretorius@pannar.co.za
Pioneer			P Fourie	philip.fourie@pioneer.com]
Syngenta	Senekal	28/01/2018	Roean Wessels & Janin wessels	roean.wessels@sensako.co.za janinewessels@yahoo.com

Table 3: Trial site information 2017/18

Locality	Planting date	Plant population	Soil classification	Top soil analysis (mg kg^{-1})					Fertiliser applied (Kg ha^{-1})	Row width (cm)	Weed control and insecticides	Nett plot size (m^2)
				pH (KCl)	P	K	Ca	Mg				
Vilioenskroon	02/01/2018	42 000	Red Clay	-	-	-	-	-	300 kg 5.3.1	91	Plough & disc	7.28
Ventersdorp	30/01/2018	42 000	-	-	-	-	-	-	25 N, 8 P, 4 K	-	Cruiser, Metolachlor, Boron	12.7
Boskop	07/11/2017	45000	-	-	-	-	-	-	-	91	-	11.83
Boskop	12/12/2017	45000	-	-	-	-	-	-	-	91	-	11.83
Lichtenburg	01/12/2017	42000	-	-	-	-	-	-	-	91	-	6.82
Rysmierbult	01/12/2017	45000								91		7.28
Potchefstroom	20/10/2017	38 000	Westleigh	6.43	52	278	958	488	N 41; P 9; K 4	90	Grammoxone	11.83
Potchefstroom	08/11/2017	38 000	Clovelly	6.22	46	370	925	533	N 41; P 9; K 4	90	Grammoxone	14.4
Potchefstroom	20/11/2017	38 000	Westleigh	6.22	46	370	925	533	N 41; P 9; K 4	90	Grammoxone	14.4
Potchefstroom	04/12/2017	38 000	Clovelly	6.22	46	370	925	533	N 41; P 9; K 4	90	Grammoxone	14.4
Potchefstroom	24/01/2018	38 000	Clovelly	-	-	-	-	-	N 41; P 9; K 4	90		14.4
Senekal	28/01/2018											7.28

Table 4: Number of days from planting to 50 percent flowering of cultivars at selected localities and planting dates 2017/2018

Cultivar	Boskop 07/11/2017	Boskop 12/12/2017	Lichtenburg 01/12/2017	Rysmierbult 01/12/2017	Viljoenskroon 02/01/2018	Ventersdorp 30/01/2018	Senekal 28/01/2018	Potchefstroom 20/10/2017	Potchefstroom 08/11/2017	Potchefstroom 20/11/2017	Potchefstroom 04/12/2017	Potchefstroom 04/12/2017	Mean
AGSUN 5101 CLP	70	61	70	66	70	73	80	81	69	67	66	75	71
AGSUN 5102 CLP	72	61	69	66	69	72	81	81	69	65	63	76	70
AGSUN 5103 CLP	73	63	71	67	71	77	78	80	72	68	65	75	72
AGSUN 5106 CLP	72	62	71	69	71	78	79	81	71	67	66	77	72
AGSUN 5270	70	58	67	65	67	77	76	75	71	65	63	70	69
AGSUN 5273	73	63	70	68	70	79	78	77	71	68	65	72	71
AGSUN 5278	72	61	69	66	69	73	77	81	68	65	63	73	70
AGSUN 8251	70	61	69	66	69	75	78	80	71	66	63	72	70
P 65 LL 02	73	62	71	70	71	71	79	81	73	70	68	72	72
P 65 LL14	70	61	67	71	67	73	77	77	69	65	65	73	70
P 65 LP 54	69	58	67	67	67	73	78	75	69	65	63	73	69
PAN 7160 CLP	68	60	70	70	70	74	79	76	70	66	65	72	70
PAN 7080	69	61	70	69	70	71	77	76	70	66	64	75	70
PAN 7100	70	60	69	67	69	68	76	75	68	66	62	71	68
PAN 7102 CLP	68	58	67	64	67	72	78	74	68	64	62	72	68
PAN 7156 CLP	69	60	70	70	70	76	81	78	69	66	63	76	71
PAN 7158 HO	73	64	69	67	69	77	79	82	71	68	66	78	72
PHB 65A70	68	58	71	63	71	68	77	75	68	66	63	72	68
SY 3970 CL	73	62	71	69	71	73	80	81	71	68	68	73	72
Mean	71	61	69	67	69	74	78	78	70	66	64	74	

Table 5: The moisture free seed oil concentration (%) of cultivars at selected localities 2017/2018

Cultivar	Boskop 12/12/2017	Ventersdorp 30/01/2018	Viljoenskroon 02/01/2018	Senekal 28/01/2018	Potchefstroom 20/10/2017	Potchefstroom 04/12/2017	Potchefstroom 24/01/2018	Mean
AGSUN 5102 CLP	44.87	34.39	43.19	32.45	44.35	45.61	35.76	40.09
AGSUN 5102 CLP	45.64	34.64	43.49	29.45	45.10	44.01	38.45	40.11
AGSUN 5103 CLP	43.73	36.85	43.31	30.72	44.07	45.70	36.23	40.09
AGSUN 5106 CLP	43.55	36.59	42.35	30.70	46.00	46.02	35.48	40.10
AGSUN 5270	43.40	42.50	45.63	38.97	49.53	46.63	37.55	43.46
AGSUN 5273	44.40	35.33	42.68	32.68	46.23	44.64	35.28	40.18
AGSUN 5278	42.39	34.23	41.97	32.11	44.67	43.85	34.29	39.07
AGSUN 8251	41.60	34.04	43.13	33.42	44.60	43.98	34.69	39.35
P 65 LL 02	48.67	43.96	45.33	37.11	49.37	50.65	39.85	44.99
P 65 LL14	47.74	42.36	45.45	35.83	49.82	48.27	39.45	44.13
P 65 LP 54	40.57	34.71	40.61	31.67	45.38	44.85	34.08	38.84
PAN 7160 CLP	46.23	33.56	45.40	33.46	49.29	48.09	37.10	41.88
PAN 7080	44.78	34.76	45.79	29.54	48.87	46.51	38.12	41.20
PAN 7100	47.15	37.78	44.51	35.41	49.21	48.02	36.21	42.61
PAN 7102 CLP	45.42	38.89	41.08	32.29	46.40	43.61	33.32	40.14
PAN 7156 CLP	44.98	37.35	41.50	29.19	47.62	43.55	35.66	39.98
PAN 7158 HO	43.58	39.68	42.56	30.64	45.03	44.18	40.53	40.88
PHB 65A70	45.35	41.99	44.12	37.94	47.67	47.48	40.34	43.55
SY 3970 CL	53.36	45.94	51.31	38.78	55.94	53.94	46.85	49.44
Mean	45.13	37.87	43.86	33.28	47.32	46.29	37.33	41.58

Table 6: The moisture free seed protein concentration (%) of cultivars at selected localities 2017/2018

Cultivar	Boskop 12/12/2017	Ventersdorp 30/01/2018	Viljoenskroon 02/01/2018	Senekal 28/01/2018	Potchefstroom 20/10/2017	Potchefstroom 04/12/2017	Potchefstroom 24/01/2018	Mean
AGSUN 5102 CLP	20.51	25.14	18.28	15.91	16.91	17.36	24.53	19.80
AGSUN 5102 CLP	19.44	23.91	19.28	15.95	16.17	17.63	22.44	19.26
AGSUN 5103 CLP	21.35	22.75	18.10	15.51	16.87	16.93	25.04	19.51
AGSUN 5106 CLP	20.63	22.34	17.76	16.71	15.21	16.21	25.01	19.13
AGSUN 5270	20.19	17.60	15.81	15.37	17.62	18.77	24.88	18.61
AGSUN 5273	19.50	22.23	16.79	15.97	16.66	18.34	25.05	19.22
AGSUN 5278	20.56	23.92	16.15	16.52	17.01	17.22	24.06	19.35
AGSUN 8251	20.27	24.74	17.49	16.11	15.67	16.87	25.04	19.45
P 65 LL 02	18.90	16.32	16.50	16.31	15.05	16.50	24.39	17.71
P 65 LL14	18.32	16.68	17.09	15.59	16.21	16.79	22.87	17.65
P 65 LP 54	21.52	24.08	18.11	17.24	14.75	16.30	24.07	19.44
PAN 7160 CLP	19.06	23.06	15.99	14.35	15.89	16.89	23.67	18.41
PAN 7080	19.23	23.16	15.92	15.87	13.19	15.35	22.98	17.96
PAN 7100	18.91	21.70	17.58	14.73	15.61	16.81	24.00	18.48
PAN 7102 CLP	19.36	16.34	18.85	17.54	16.96	16.86	24.49	18.63
PAN 7156 CLP	18.19	13.48	18.14	13.49	14.66	16.42	22.75	16.73
PAN 7158 HO	20.01	16.35	16.92	16.02	15.73	16.92	24.24	18.03
PHB 65A70	19.81	17.10	16.93	15.85	15.77	15.77	22.42	17.66
SY 3970 CL	19.11	22.88	16.06	17.28	14.97	17.29	25.00	18.94
Mean	19.73	20.73	17.25	15.91	16.91	16.91	24.05	18.63

Table 7: Mean seed yield (t ha^{-1}) of cultivars at each locality 2017/2018

Cultivar	Boskop 07/11/2017	Boskop 12/12/2017	Lichtenburg 01/12/2017	Rysmierbult 01/12/2017	Vilionskroon 02/01/2018	Potchefstroom 20/10/2017	Potchefstroom 08/11/2017	Potchefstroom 20/11/2017	Potchefstroom 04/12/2017	Potchefstroom 24/01/2018	Senekal 28/01/2018	Ventersdorp 30/01/2018	Mean
AGSUN 5101 CLP	2.72	3.59	1.80	1.94	3.14	2.52	2.12	2.36	2.67	1.39	1.03	1.38	2.22
AGSUN 5102 CLP	2.95	3.31	1.88	2.15	2.78	2.42	2.19	2.51	2.69	1.30	1.24	1.18	2.22
AGSUN 5103 CLP	3.42	3.69	2.24	2.47	3.35	2.46	2.28	2.52	3.04	1.11	1.23	1.49	2.44
AGSUN 5106 CLP	3.33	3.35	2.06	2.78	3.26	2.26	2.28	2.53	2.93	1.33	1.45	1.69	2.44
AGSUN 5270	3.13	3.45	2.14	2.35	3.41	2.45	2.52	2.72	2.82	1.70	1.57	1.22	2.46
AGSUN 5273	2.88	3.23	2.19	2.25	3.16	2.32	2.30	2.35	2.55	1.52	1.36	1.33	2.29
AGSUN 5278	2.77	2.98	2.11	2.09	2.90	2.30	2.53	2.22	3.02	1.46	1.49	1.41	2.27
AGSUN 8251	3.31	3.47	2.34	2.51	3.25	2.20	2.15	2.08	2.71	1.56	1.39	1.45	2.37
P 65 LL 02	2.80	3.47	2.26	2.45	3.05	2.89	2.88	3.02	3.06	1.39	1.31	1.51	2.51
P 65 LL14	3.20	3.15	1.59	1.89	3.19	2.65	2.46	3.01	2.99	1.46	1.55	1.63	2.40
P 65 LP 54	2.92	3.67	1.96	1.97	2.81	2.66	2.69	2.78	3.07	1.46	1.16	1.34	2.37
PAN 7160 CLP	3.35	3.65	2.16	2.40	3.32	2.73	2.65	2.73	3.07	1.47	1.51	1.82	2.57
PAN 7080	2.99	3.53	2.20	2.06	3.34	2.73	2.23	2.93	3.29	1.54	0.94	1.31	2.42
PAN 7100	3.27	3.40	1.92	2.64	3.48	2.66	2.69	2.73	3.07	1.52	1.28	1.41	2.51
PAN 7102 CLP	3.05	3.46	2.30	2.05	2.90	2.60	2.75	2.85	2.93	1.63	1.51	1.11	2.43
PAN 7156 CLP	2.68	3.80	1.74	2.75	2.78	2.52	2.6	2.71	3.17	1.85	1.25	1.62	2.46
PAN 7158 HO	2.54	3.19	2.09	2.68	2.99	2.63	2.6	2.56	2.92	1.29	1.16	1.36	2.33
PHB 65A70	2.95	3.13	1.89	2.15	2.34	2.77	2.82	2.9	3.27	1.82	1.36	1.56	2.41
SY 3970 CL	2.59	2.97	1.52	1.84	2.62	2.38	2.57	2.51	2.71	1.32	1.35	1.15	2.13
Mean	2.99	3.39	2.02	2.28	3.06	2.54	2.49	2.63	2.95	1.48	1.32	1.42	2.38
CV	10.30	8.70	13.60	11.30	9.50	8.60	11.40	7.70	8.10	14.50	19.60	17.40	

Table 8: Oil yield (t ha^{-1}) of cultivars at selected localities 2017/18

Cultivar	Boskop 12/12/2017	Ventersdorp 30/01/2018	Viljoenskroon 02/01/2018	Senekal 28/01/2018	Potchefstroom 20/10/2017	Potchefstroom 04/12/2017	Potchefstroom 24/01/2018	Mean
AGSUN 5102 CLP	1.61	0.47	1.36	0.33	1.12	1.22	0.50	0.94
AGSUN 5102 CLP	1.51	0.41	1.21	0.37	1.09	1.18	0.55	0.90
AGSUN 5103 CLP	1.61	0.55	1.45	0.38	1.08	1.39	0.40	0.98
AGSUN 5106 CLP	1.46	0.62	1.38	0.45	1.04	1.35	0.47	0.97
AGSUN 5270	1.50	0.52	1.56	0.61	1.21	1.31	0.64	1.05
AGSUN 5273	1.43	0.47	1.35	0.44	1.07	1.14	0.54	0.92
AGSUN 5278	1.26	0.48	1.22	0.48	1.03	1.32	0.50	0.90
AGSUN 8251	1.44	0.49	1.40	0.46	0.98	1.19	0.54	0.93
P 65 LL 02	1.69	0.66	1.38	0.49	1.43	1.55	0.55	1.11
P 65 LL14	1.50	0.69	1.45	0.56	1.32	1.44	0.58	1.08
P 65 LP 54	1.49	0.47	1.14	0.37	1.21	1.38	0.50	0.93
PAN 7160 CLP	1.69	0.61	1.51	0.51	1.35	1.48	0.55	1.10
PAN 7080	1.58	0.46	1.53	0.28	1.33	1.53	0.59	1.04
PAN 7100	1.60	0.53	1.55	0.45	1.31	1.47	0.55	1.07
PAN 7102 CLP	1.57	0.43	1.19	0.49	1.21	1.28	0.54	0.96
PAN 7156 CLP	1.71	0.61	1.15	0.36	1.20	1.38	0.66	1.01
PAN 7158 HO	1.39	0.54	1.27	0.36	1.18	1.29	0.52	0.94
PHB 65A70	1.42	0.66	1.03	0.52	1.32	1.55	0.73	1.03
SY 3970 CL	1.58	0.53	1.34	0.52	1.33	1.46	0.62	1.06
Mean	1.53	0.54	1.34	0.44	1.20	1.37	0.55	1.00

Table 9: Parameters calculated from the analysis of variance for yield data at each locality

Locality	Mean (t ha^{-1})	SE	CV (%)	GCV	t	SE(t)	tn
Boskop 07/11/2017	2.99	0.18	10.30	6.80	0.30	0.15	0.56
Lichtenburg 01/12/2017	2.02	0.16	13.60	8.70	0.29	0.15	0.55
Rysmierbult 01/12/2017	2.28	0.15	11.30	11.40	0.50	0.14	0.75
BOSKOP2 12/12/2017	3.39	0.17	8.70	4.90	0.24	0.15	0.49
Vilionskroon 02/01/2018	3.06	0.17	9.50	8.10	0.42	0.15	0.68
Ventersdorp 30/01/2018	1.42	0.14	17.40	8.80	0.20	0.15	0.43
Senekal 28/01/2018	1.32	0.15	19.60	6.60	0.10	0.15	0.25
Potchefstroom 20/10/2017	2.54	0.13	8.60	5.80	0.31	0.15	0.57
Potchefstroom 08/11/2017	2.49	0.16	11.40	6.80	0.26	0.15	0.51
Potchefstroom 20/11/2017	2.63	0.12	7.70	9.00	0.58	0.12	0.81
Potchefstroom 04/12/2017	2.95	0.14	8.10	5.30	0.30	0.15	0.56
Potchefstroom 24/01/2008	1.48	0.12	14.50	9.10	0.28	0.15	0.54

Table 10: Regression line coordinates at different yield potentials 2017/18

Cultivar	Yield potential (t ha^{-1})						Mean (t ha^{-1})	Intercept	Slope	D-parameter
	1	1.5	2	2.5	3	3.5				
AGSUN 5101 CLP	0.75	1.29	1.82	2.36	2.89	3.43	2.22	-0.32	1.07	0.034
AGSUN 5102 CLP	0.83	1.33	1.83	2.33	2.83	3.33	2.22	-0.17	1.00	0.008
AGSUN 5103 CLP	0.79	1.39	1.98	2.58	3.17	3.77	2.44	-0.40	1.19	0.042
AGSUN 5106 CLP	1.09	1.58	2.07	2.56	3.05	3.54	2.44	0.11	0.98	0.061
AGSUN 5270	1.07	1.57	2.07	2.57	3.07	3.57	2.46	0.07	1.00	0.028
AGSUN 5273	1.05	1.50	1.94	2.39	2.83	3.28	2.29	0.16	0.89	0.024
AGSUN 5278	1.14	1.56	1.97	2.39	2.80	3.22	2.27	0.31	0.83	0.025
AGSUN 8251	1.06	1.54	2.01	2.49	2.96	3.44	2.37	0.11	0.95	0.088
P 65 LL 02	1.09	1.60	2.11	2.62	3.13	3.64	2.51	0.07	1.02	0.039
P 65 LL14	1.05	1.54	2.03	2.52	3.01	3.50	2.40	0.07	0.98	0.071
P 65 LP 54	0.85	1.40	1.95	2.50	3.05	3.60	2.37	-0.25	1.10	0.032
PAN 7160 CLP	1.15	1.67	2.18	2.70	3.21	3.73	2.57	0.12	1.03	0.014
PAN 7080	0.78	1.38	1.97	2.57	3.16	3.76	2.42	-0.41	1.19	0.044
PAN 7100	0.97	1.53	2.09	2.65	3.21	3.77	2.51	-0.15	1.12	0.022
PAN 7102 CLP	1.05	1.55	2.04	2.54	3.03	3.53	2.43	0.06	0.99	0.041
PAN 7156 CLP	1.13	1.61	2.09	2.57	3.05	3.53	2.46	0.17	0.96	0.081
PAN 7158 HO	1.00	1.48	1.96	2.44	2.92	3.40	2.33	0.04	0.96	0.047
PHB 65A70	1.26	1.68	2.09	2.51	2.92	3.34	2.41	0.43	0.83	0.094
SY 3970 CL	0.90	1.35	1.80	2.25	2.70	3.15	2.13	0.00	0.90	0.035

Table 11: Yield probability (%) of cultivars for 2017/18 at different yield potentials

Cultivar	Yield potential (t ha^{-1})					
	1	1.5	2	2.5	3	3.5
AGSUN 5101 CLP	13	15	18	23	29	37
AGSUN 5102 CLP	6	4	4	3	4	5
AGSUN 5103 CLP	20	31	46	65	78	87
AGSUN 5106 CLP	62	61	61	59	57	56
AGSUN 5270	64	65	65	66	65	64
AGSUN 5273	61	50	36	25	15	11
AGSUN 5278	77	63	43	25	12	6
AGSUN 8251	57	55	51	49	45	43
P 65 LL 02	65	68	70	72	73	73
P 65 LL14	56	55	54	53	51	50
P 65 LP 54	24	31	40	50	60	69
PAN 7160 CLP	85	90	93	95	95	95
PAN 7080	19	30	45	63	76	86
PAN 7100	43	57	72	83	91	94
PAN 7102 CLP	58	59	57	58	55	55
PAN 7156 CLP	65	64	62	59	56	54
PAN 7158 HO	50	47	43	40	37	34
PHB 65A70	76	70	61	51	40	32
SY 3970 CL	33	24	15	10	7	5

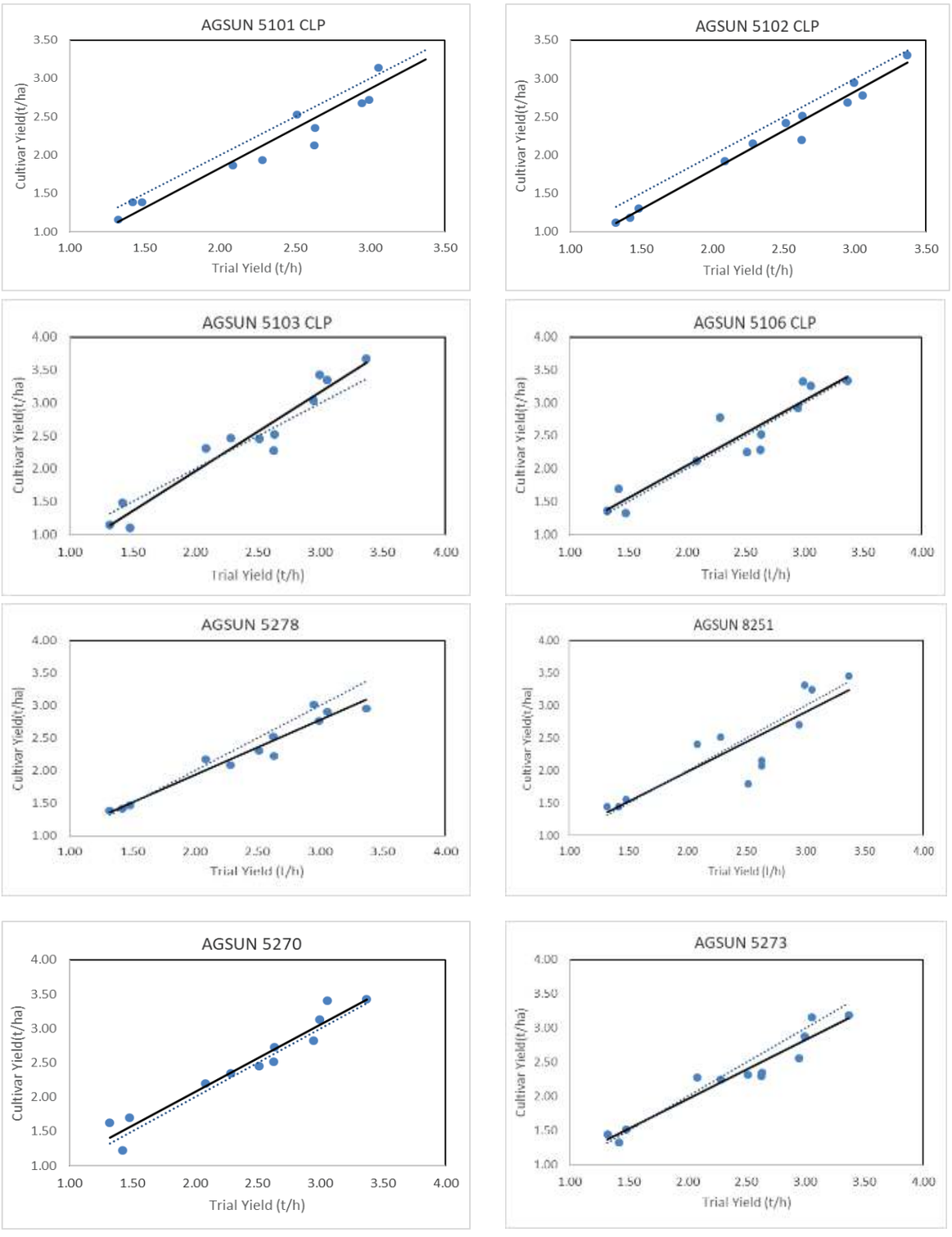
Table 12: Yield probability (%) of cultivars 2016/2017 and 2017/2018 at different yield potentials

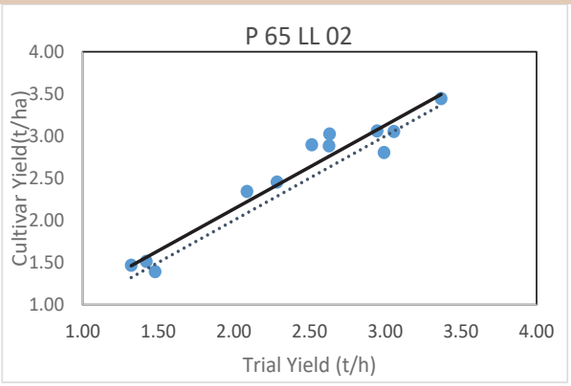
Cultivar	Yield potential (t ha^{-1})					
	1	1.5	2	2.5	3	3.5
AGSUN 5270	51	53	53	55	55	56
AGSUN 5273	31	35	38	44	48	54
AGSUN 5278	72	59	44	29	17	10
AGSUN 8251	62	58	54	49	44	40
P 65 LL02	52	53	54	55	55	57
P 65 LL14	34	37	40	44	47	51
P 65 LP54	64	57	48	40	32	25
PAN 7080	17	27	40	56	70	82
PAN 7100	41	50	60	70	78	84
PAN 7102 CLP	31	40	50	62	71	79
PAN 7156 CLP	71	68	62	57	50	45
PAN 7160 CLP	78	80	83	85	86	86
PHB 65A70	55	47	39	30	23	18

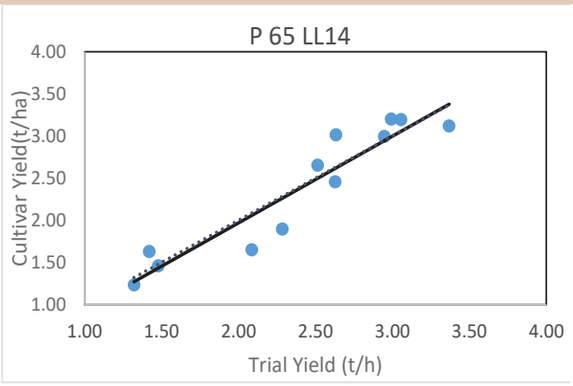
Table 13: Yield probability (%) of cultivars for three years data 2015/16 to 2017/2018 at different yield potentials

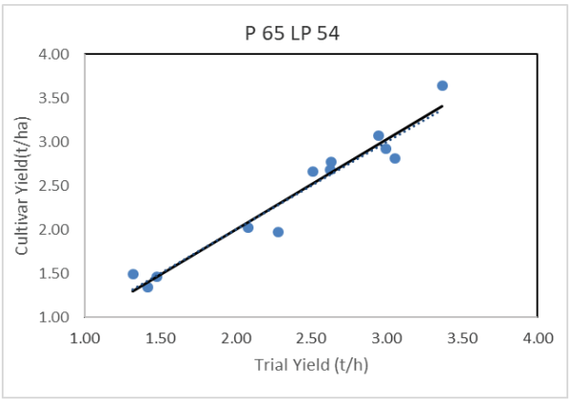
Cultivar	Yield potential (t ha^{-1})					
	1	1.5	2	2.5	3	3.5
AGSUN5270	46	48	50	52	54	55
AGSUN5273	28	33	36	41	45	50
AGSUN5278	58	49	39	29	21	15
AGSUN8251	57	54	51	49	46	43
P65LL02	59	60	58	58	56	56
P65LL14	50	50	48	48	47	47
PAN7080	37	45	53	63	70	77
PAN7100	48	53	59	64	68	72
PAN7102CLP	43	50	56	64	69	75
PAN7160CLP	67	71	73	76	78	80
PHB65A70	54	48	40	34	27	23

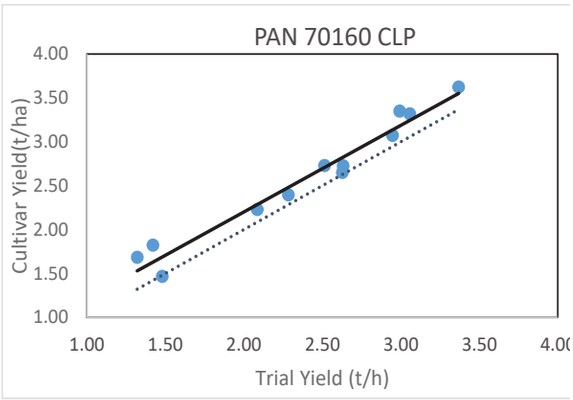
Figure 1: Regression lines for cultivars 2017/2018

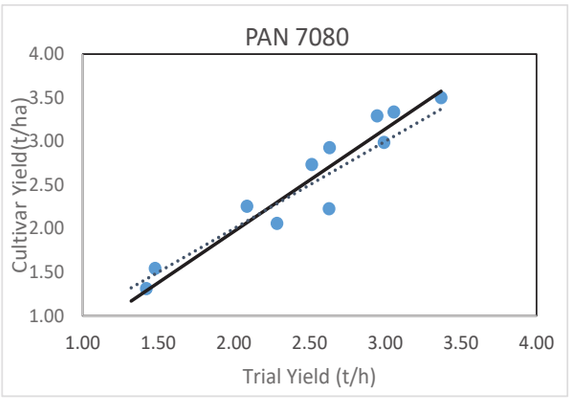


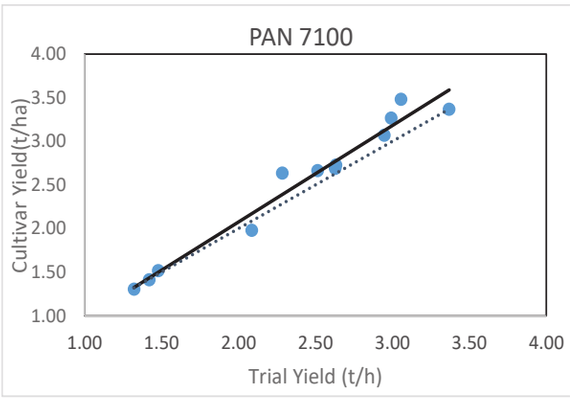

P 65 LL 02
Cultivar Yield(t/ha)
Trial Yield (t/h)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
1.00 1.50 2.00 2.50 3.00 3.50 4.00

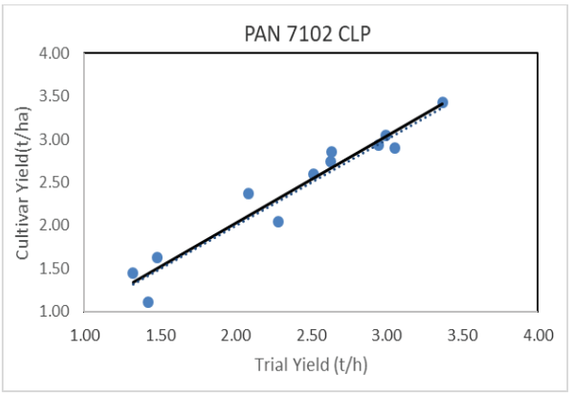

P 65 LL14
Cultivar Yield(t/ha)
Trial Yield (t/h)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
1.00 1.50 2.00 2.50 3.00 3.50 4.00

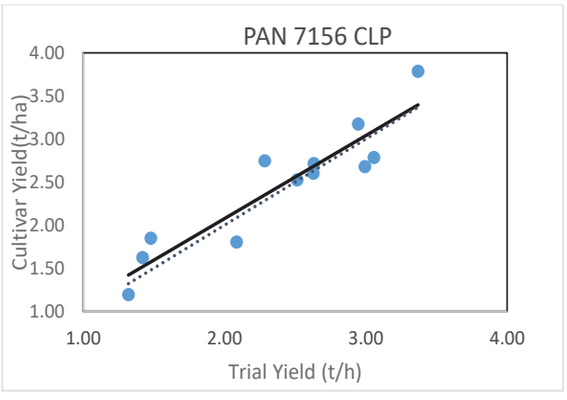

P 65 LP 54
Cultivar Yield(t/ha)
Trial Yield (t/h)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
1.00 1.50 2.00 2.50 3.00 3.50 4.00


PAN 70160 CLP
Cultivar Yield(t/ha)
Trial Yield (t/h)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
1.00 1.50 2.00 2.50 3.00 3.50 4.00


PAN 7080
Cultivar Yield(t/ha)
Trial Yield (t/h)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
1.00 1.50 2.00 2.50 3.00 3.50 4.00


PAN 7100
Cultivar Yield(t/ha)
Trial Yield (t/h)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
1.00 1.50 2.00 2.50 3.00 3.50 4.00


PAN 7102 CLP
Cultivar Yield(t/ha)
Trial Yield (t/h)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
1.00 1.50 2.00 2.50 3.00 3.50 4.00


PAN 7156 CLP
Cultivar Yield(t/ha)
Trial Yield (t/h)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
1.00 2.00 3.00 4.00

20

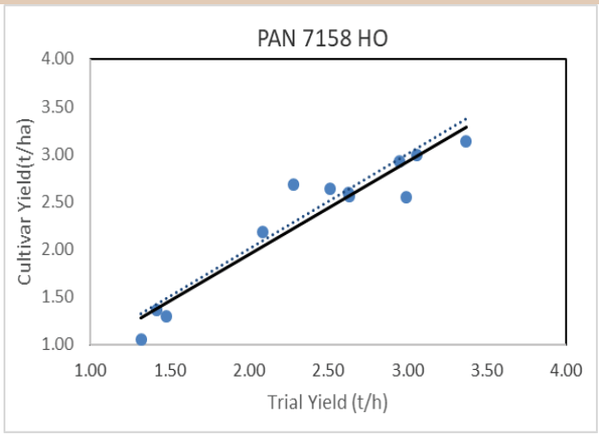
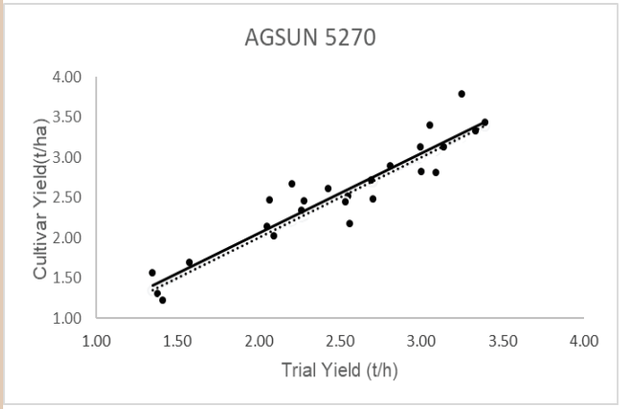
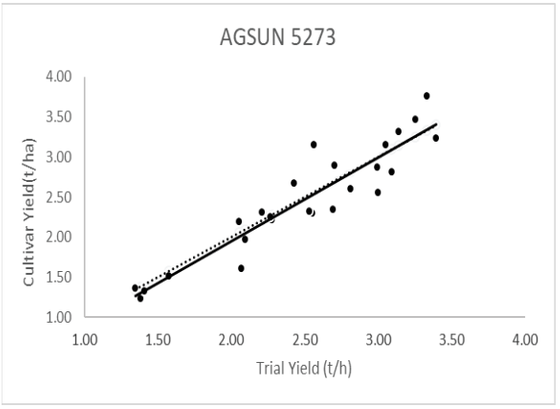
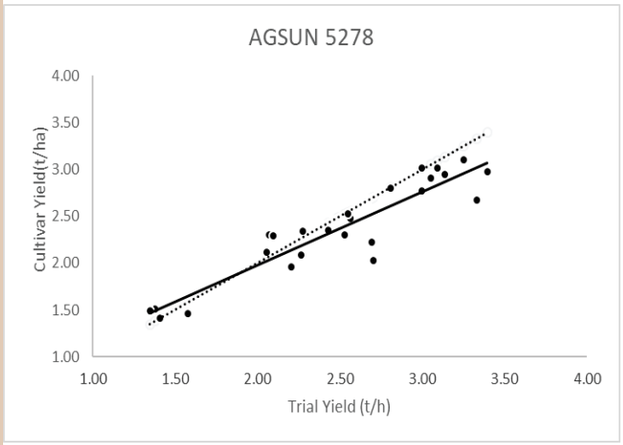
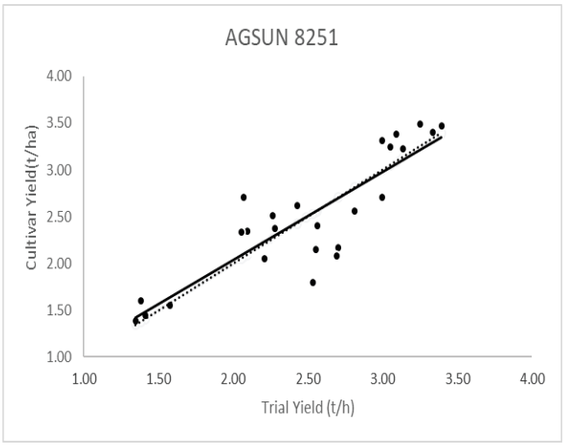


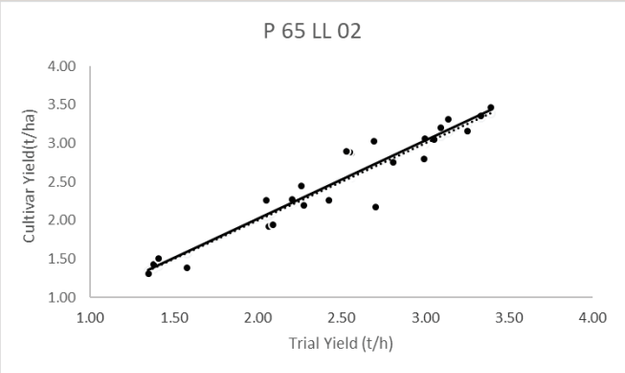
Figure 2 Regression lines for cultivars 2016/2017 and 2017/2018

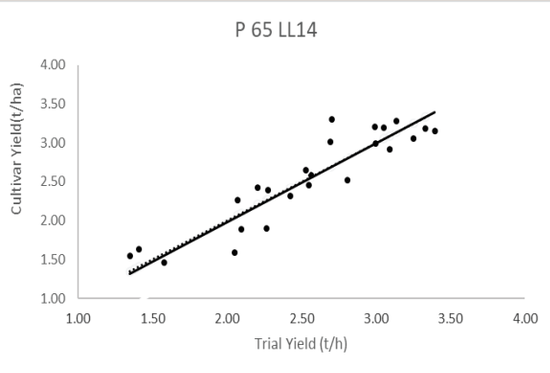


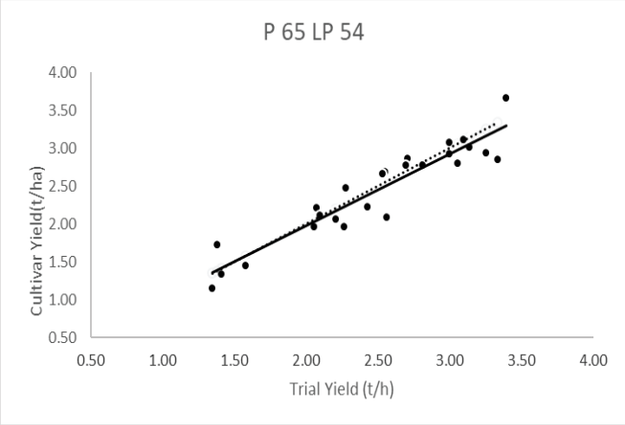


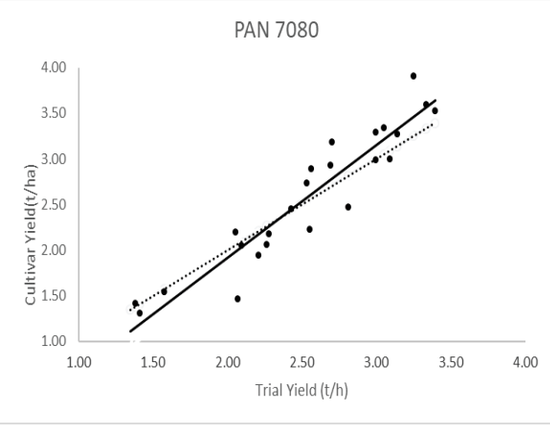


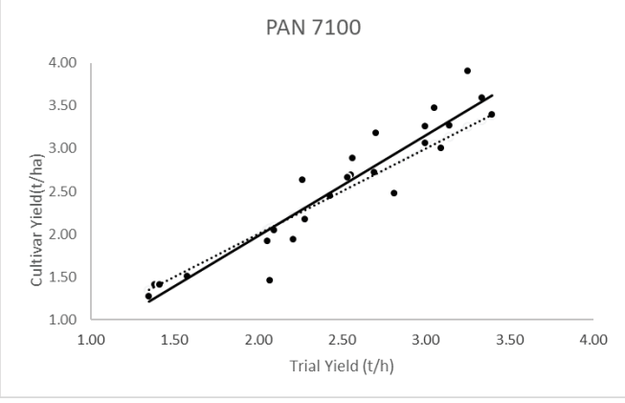


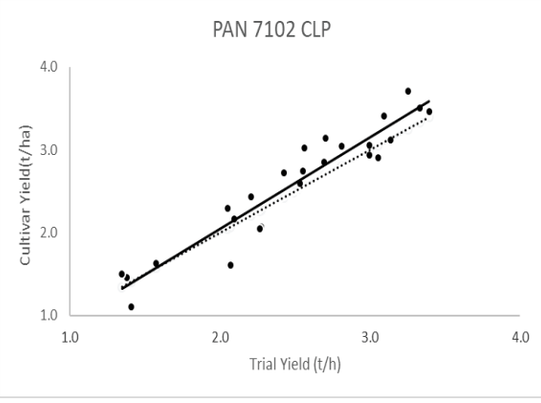

P 65 LL 02
Cultivar Yield(t/ha)
Trial Yield (t/h)

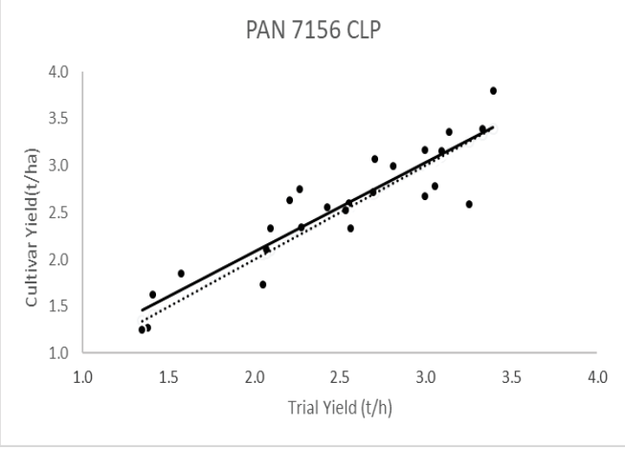

P 65 LL14
Cultivar Yield(t/ha)
Trial Yield (t/h)

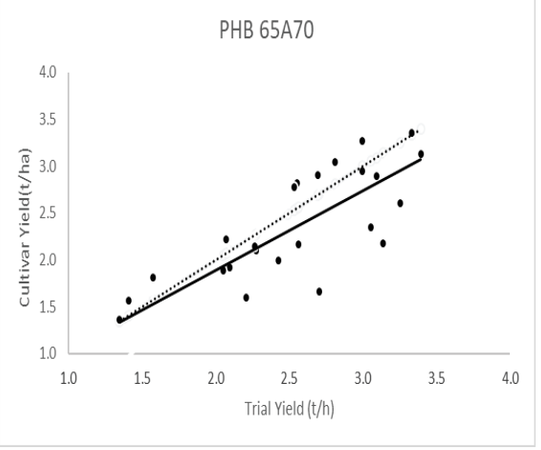

P 65 LP 54
Cultivar Yield(t/ha)
Trial Yield (t/h)


PAN 7080
Cultivar Yield(t/ha)
Trial Yield (t/h)


PAN 7100
Cultivar Yield(t/ha)
Trial Yield (t/h)


PAN 7102 CLP
Cultivar Yield(t/ha)
Trial Yield (t/h)


PAN 7156 CLP
Cultivar Yield(t/ha)
Trial Yield (t/h)


PHB 65A70
Cultivar Yield(t/ha)
Trial Yield (t/h)

22

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%