South African Sunflower Crop

Quality Report
2020/2021
Season

Compiled and issued by:
The Southern African Grain Laboratory NPC

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South African

Commercial sunflower quality for the 2020/21 Season

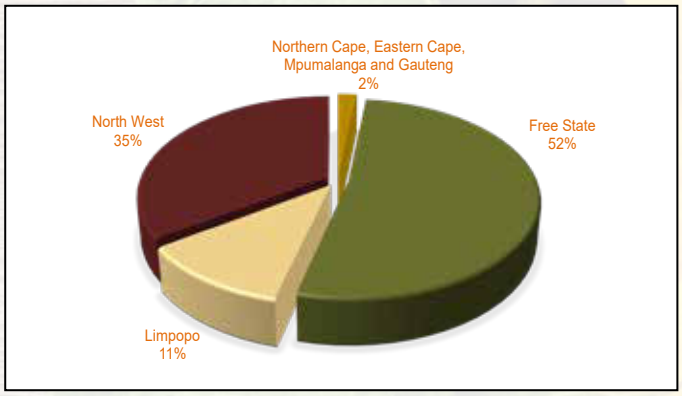
Acknowledgements
With gratitude to:

- ***Oilseeds Advisory Committee (OAC) as well as the Oil & Protein Seed Development Trust (OPDT) 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, Land Reform and Rural Development (DALRRD) 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.***
- ***Precision Oil Laboratories for providing Fatty Acid Profile analyses.***

Introduction

The final commercial sunflower crop figure of the 2020/21 season as overseen by the National Crop Estimates Liaison Committee (CELC) is 678 000 tons, an increase of 0.11% compared to the final crop estimate figure. The crop decreased by 14% (110 500 tons) year on year. The major sunflower-producing provinces, namely the Free State and North West, contributed 87% of the total crop.

Graph 1: Provincial contribution to the production of the 2020/21 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 37. One hundred and fifty-seven (157) 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. Twenty samples, randomly selected to represent the different production regions, as well as 30 cultivar samples were submitted to Precision Oil Laboratories for fatty acid profile analyses.

This is the nineth 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 various 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 seed produced in different production regions nationally.

The results of this survey are available on the SAGL website (www.sagl.co.za). Hard copy reports are distributed to all Directly Affected Groups and interested parties. The report is also available to read or 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 2020/21 season conducted by the ARC-Grain Crops Institute in collaboration with Agricol, Pannar, Pioneer, Syngenta, Sensako and Limagrain 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 2020/21 season stands at 50.4 million metric tons with the Ukraine and Russia contributing 54% to this total. An area of 28.0 million hectares were harvested resulting in a yield of 1.80 metric tons/hectare. The forecasted figure for the 2021/22 season is 57.7 million metric tons harvested on 29.9 million hectares and with a yield of 1.93 metric tons/hectare.

Please see Table 1 for the world sunflower seed supply and disappearance figures.

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

Season	2016/17	2017/18	2018/19	2019/20	2020/21 (Revised)	2021/22 (Forecast)
Area Harvested (1 000 Ha)	***26 964***	***26 885***	***27 265***	***27 413***	***28 037***	***29 915***
Yield (MT/Ha)	***1.86***	***1.83***	***1.91***	***2.03***	***1.80***	***1.93***
Production (1 000 MT)						
Argentina	3 300	3 400	3 530	3 020	2 800	3 100
European Union	8 641	10 058	9 482	9 469	8 904	10 574
China	2 750	2 580	2 550	2 680	2 750	2 850
Russia	11 600	11 000	12 756	15 379	13 420	15 400
Ukraine	15 100	13 400	15 250	16 500	13 900	16 800
United States	1 203	970	956	887	1 353	863
South Africa	874	862	678	810	677	820
Turkey	1 470	1 700	1 530	1 700	1 580	1 750
Other	5 130	5 086	5 292	5 202	5 032	5 527
TOTAL	***50 068***	***49 056***	***52 024***	***55 647***	***50 416***	***57 684***
Import (1 000 MT)						
Turkey	611	721	1 051	1 058	844	840
European Union	632	520	550	1 057	817	630
Other	1 396	1 322	1 445	1 451	1 297	1 410
TOTAL	***2 639***	***2 563***	***3 046***	***3 566***	***2 958***	***2 880***
Export (1 000 MT)						
Argentina	74	58	149	214	178	161
United States	99	89	87	64	73	63
Russia	362	103	338	1 278	528	270
Ukraine	261	50	119	76	186	220
Other	1 804	2 234	2 392	1 980	1 921	2 222
TOTAL	***2 600***	***2 534***	***3 085***	***3 612***	***2 886***	***2 936***
Oilseed crushed	***44 845***	***44 663***	***47 231***	***50 300***	***45 410***	***51 275***

National Sunflower Association website www.sunflowernsa.com, Table updated 12 January 2022; 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 utilised for sunflower production decreased by 4.5% to 477 800 ha, compared to the 500 300 ha of the previous season. This season's area planted is the lowest since the 2011/12 season. The national yield average decreased by 10% to 1.42 t/ha from the 1.58 t/ha of the previous season.

According to *The Bureau for Food and Agricultural Policy (BFAP) Baseline, Agricultural Outlook 2021 – 2030*, only 450 000 hectares are expected to remain under sunflower by 2030 under the current baseline conditions. Over the same period, yields are expected to improve by 29%, due largely to improvements in technology, continuous improvement of farming practices as well as removal of more marginal land from production. This improvement is sufficient to supply the growth in domestic demand.

New technology on high-oil sunflower could improve the outlook for sunflower production as certain cultivars have the ability to produce oil contents as high as 50%, without any meaningful yield drag. One of the oilseed crushers has also introduced premiums for sunflower seed with oil contents exceeding 40%.

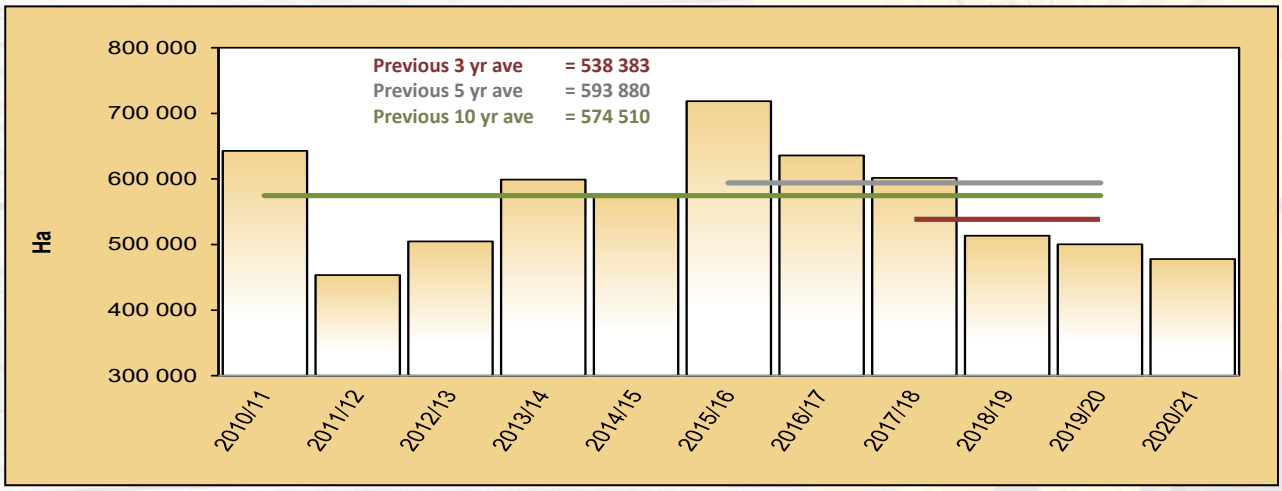
Please see Table 2 for an overview of sunflower production under dry land conditions versus irrigation in the 2020/21 season, compared to the 2019/20 season. Graphs 2 to 4 provide national figures with regards to hectares planted, tons produced and yields obtained over the last 11 seasons and Graphs 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

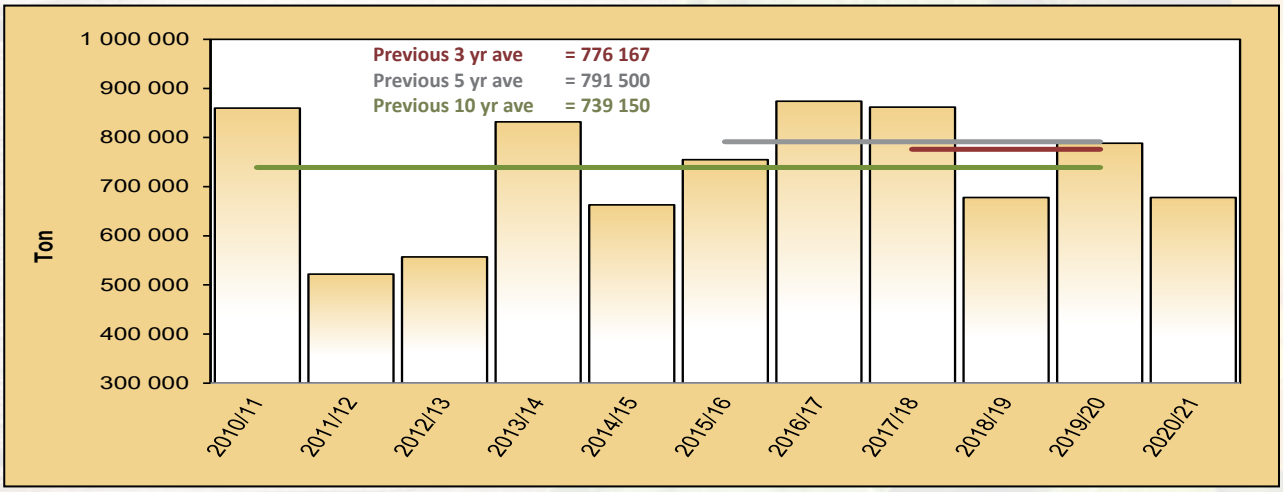
Province	Type of production	2020/21			2019/20		
		Hectares planted, ha	Production, tons	Yield, t/ha	Hectares planted, ha	Production, tons	Yield, t/ha
Western Cape	Dryland	-	-	-	-	-	-
	Irrigation	-	-	-	-	-	-
	Total	-	-	-	-	-	-
Northern Cape	Dryland	-	-	-	-	-	-
	Irrigation	1 100	1 320	1.20	1 200	1 430	1.19
	Total	1 100	1 320	1.20	1 200	1 430	1.19
Free State	Dryland	229 200	338 000	1.47	255 500	434 350	1.70
	Irrigation	5 800	14 500	2.50	4 500	10 250	2.28
	Total	235 000	352 500	1.50	260 000	444 600	1.71
Eastern Cape	Dryland	120	120	1.00	120	280	2.33
	Irrigation	180	330	1.83	180	470	2.61
	Total	300	450	1.50	300	750	2.50
KwaZulu-Natal	Dryland	-	-	-	-	-	-
	Irrigation	-	-	-	-	-	-
	Total	-	-	-	-	-	-
Mpumalanga	Dryland	3 500	5 250	1.50	2 555	3 475	1.36
	Irrigation	-	-	-	245	445	-
	Total	3 500	5 250	1.50	2 800	3 920	1.40
Limpopo	Dryland	73 500	70 800	0.96	64 000	62 800	0.98
	Irrigation	3 000	5 700	1.90	1 000	2 200	2.20
	Total	76 500	76 500	1.00	65 000	65 000	1.00
Gauteng	Dryland	4 400	5 720	1.30	3 750	5 100	1.36
	Irrigation	-	-	-	250	500	2.00
	Total	4 400	5 720	1.30	4 000	5 600	1.40
North West	Dryland	155 500	233 100	1.50	165 000	263 000	1.59
	Irrigation	1 500	3 160	2.11	2 000	4 200	2.10
	Total	157 000	236 260	1.50	167 000	267 200	1.60
RSA	Dryland	466 220	652 990	1.40	490 925	769 005	1.57
	Irrigation	11 580	25 010	2.16	9 375	19 495	2.08
	Total	477 800	678 000	1.42	500 300	788 500	1.58

Figures provided by the CEC.

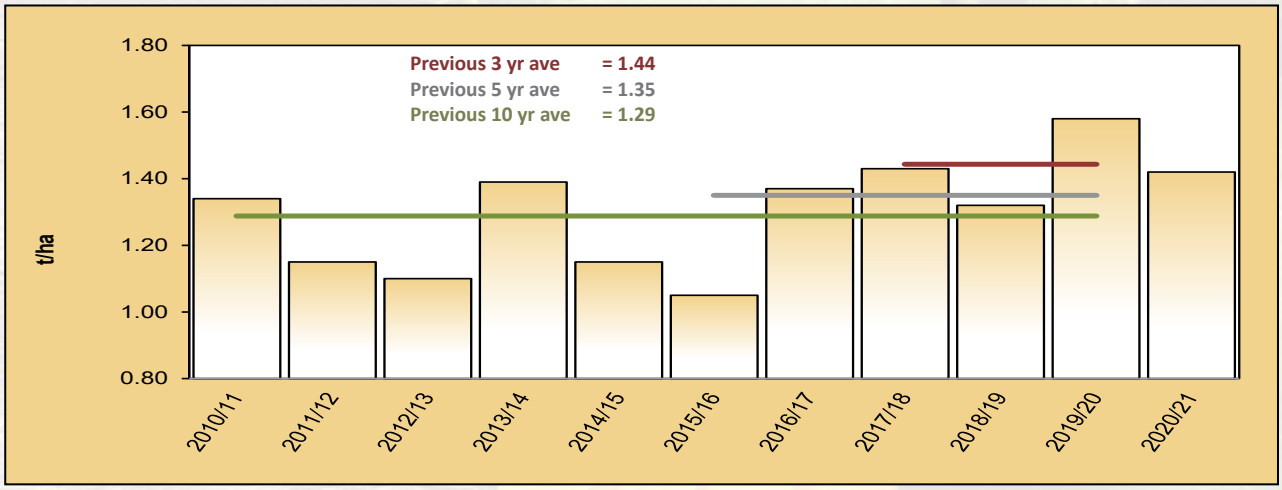
Graph 2: Total RSA area utilised for sunflower production from 2010/11 to 2020/21



Graph 3: Sunflower production in RSA from 2010/11 to 2020/21

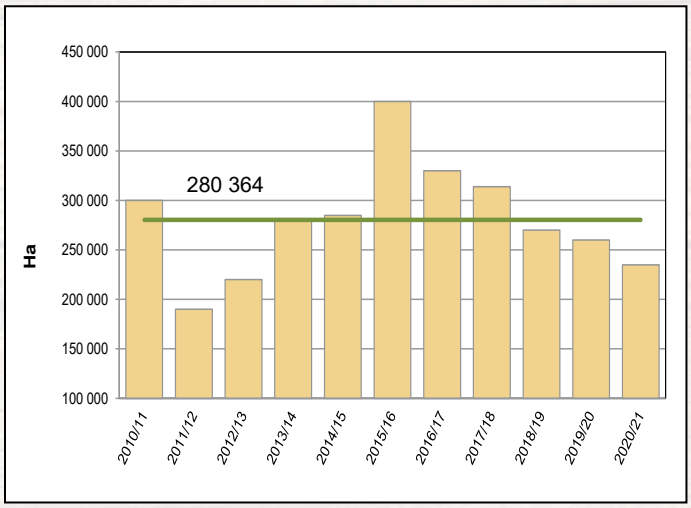


Graph 4: RSA Sunflower yield from 2010/11 to 2020/21

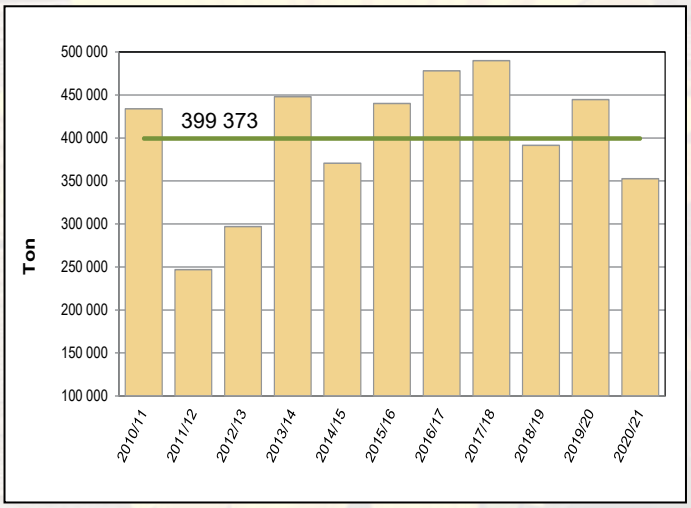


Figures provided by the CEC.

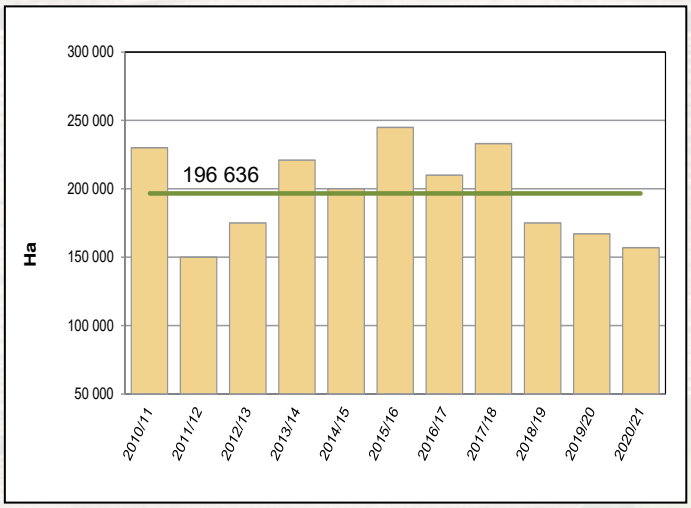
Graph 5: Area utilised for sunflower production in the Free State since 2010/11



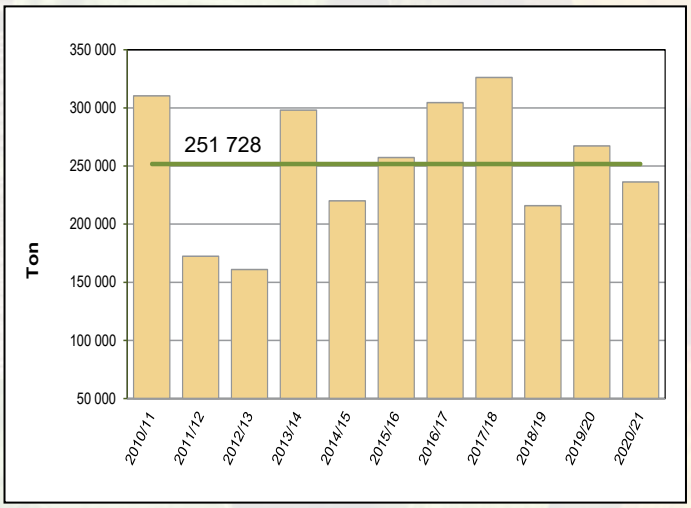
Graph 6: Sunflower production in the Free State since 2010/11



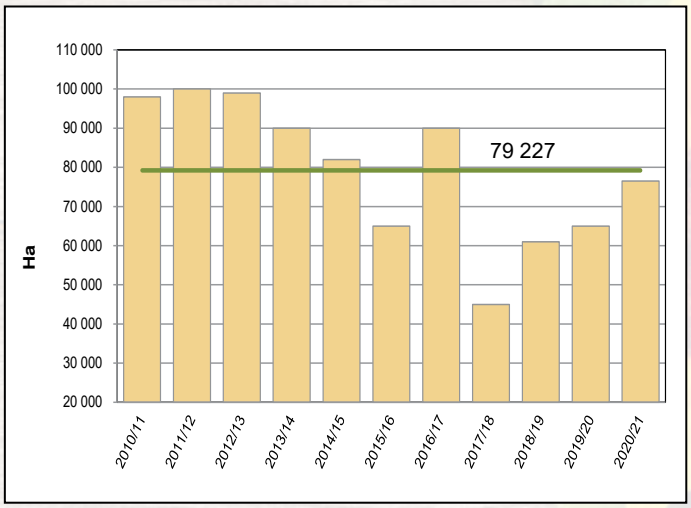
Graph 7: Area utilised for sunflower production in North West since 2010/11



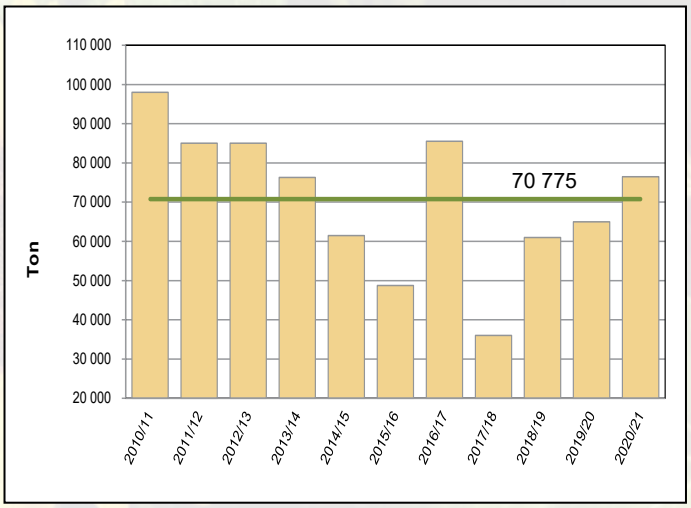
Graph 8: Sunflower production in North West since 2010/11



Graph 9: Area utilised for sunflower production in Limpopo since 2010/11



Graph 10: Sunflower production in Limpopo since 2010/11



Figures provided by the CEC.

Eleven season average

Supply and Demand

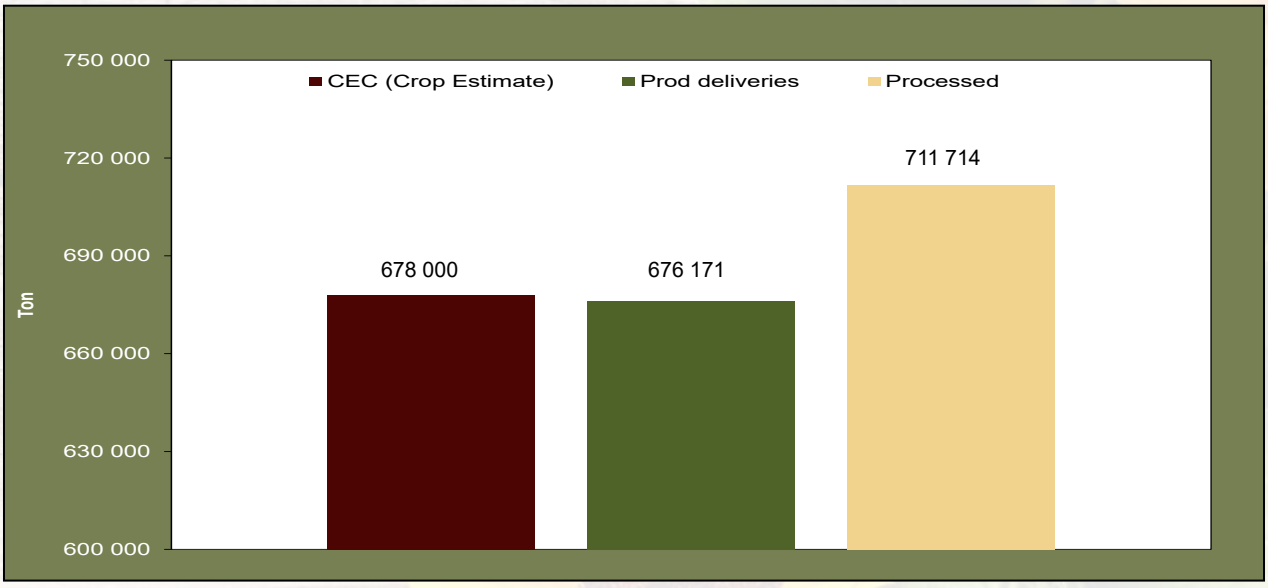
The sunflower seed marketing season dates from March to February. According to SAGIS supply and demand figures for the 2021/22 marketing season to date (March 2021 to January 2022), opening stock decreased by almost 55% compared to the previous marketing season and was 37% (35 879 tons) lower than the 10-year average.

To date, 1 256 tons of sunflower and sunflower seed products have been imported compared to the 471 and 457 tons of the previous two seasons respectively. The 10-year import average is 28 971 tons. Of the 711 714 tons of sunflower seeds processed so far, only 1 414 tons (0.2%) was used for human consumption and 5 340 tons (0.8%) 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 17% less than in the previous season as well as almost 7% less than the 10-year average of 756 919 tons.

According to *BFAP Baseline*, vegetable oil consumption declined in 2020 due to pressure on consumer spending and lockdown restrictions, with further reductions expected in 2021. Growth is however expected to resume in the medium term and by 2030 consumption is projected to be 16% higher than in the 2018-20 base period. From 2010 to 2020, sunflower oil consumption increased by 28% and by 2030, consumption is expected to rise by a further 17%.

Exports to date amount to 200 tons, compared to the 1 140 tons of the 2020/21 season. Globally, Russia, followed by the Ukraine and Argentina were the largest exporters of sunflower seeds during 2020/21. The United States was only the fourth largest exporter during this season. The Ukraine (5.3 million metric tons) and Russia (3.2 million metric tons) accounted for 75% of total sunflower oil exports worldwide in the corresponding period *(National Sunflower Association website www.sunflowernsa.com, Table updated January 12, 2022; Source: Oil World & USDA)*.

Graph 11: Sunflower supply and demand overview for the current marketing season (Mar 2021 - Feb 2022)



Information provided by SAGIS.

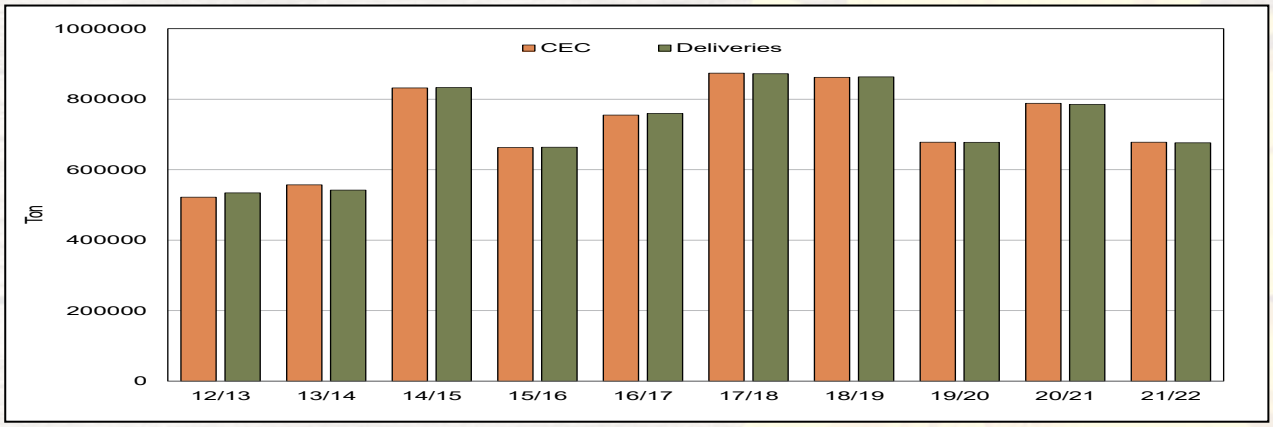
SAGIS South African Grain Information Service
Suid-Afrikaanse Graan Inligtingsdiens

SUNFLOWERSEED: SUPPLY AND DEMAND TABLE BASED ON SAGIS' INFO (TON) — **Publication date: 2022-02-25**

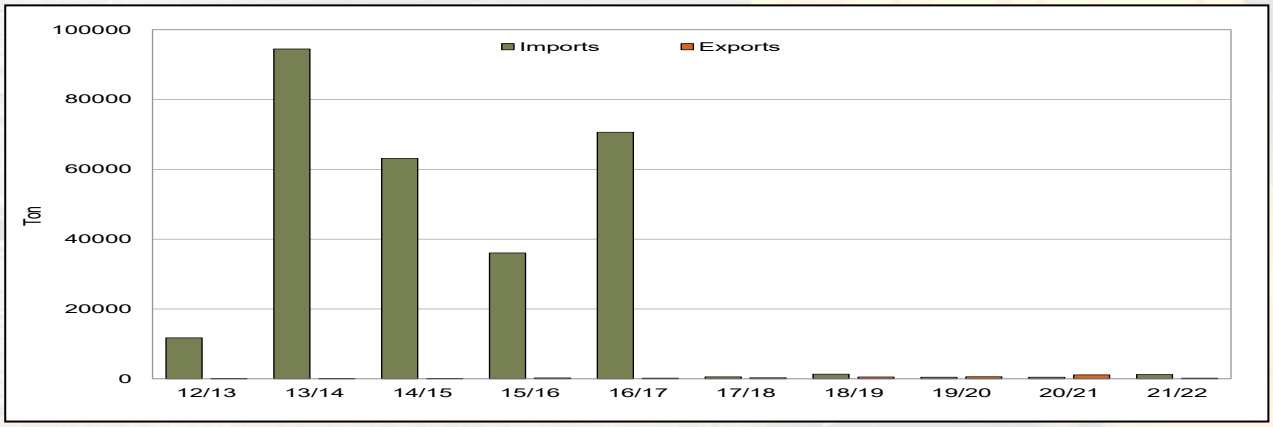
	Season (Mar - Feb)																Current Season Mar-Jan	10 Year average
	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	2011/12-2020/21
																	***	
																	11	
CEC (Crop Estimate)	620 000	520 000	300 000	872 000	801 000	490 000	860 000	522 000	557 000	832 000	663 000	755 000	874 000	862 000	678 000	788 500	678 000	739 150
SUPPLY																		
Opening stock (1 Mar)	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	120 165	135 325	60 964	96 843
Prod deliveries	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	863 184	677 674	785 567	676 171	739 776
Imports	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	457	471	1 256	28 971
Surplus	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	6 863	6 520	7 200	9 426	6 684
Total Supply	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	1 026 212	804 816	928 563	747 817	872 274
DEMAND																		
Processed	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	900 045	664 027	861 295	711 714	763 449
-human	1 300	1 200	2 100	2 400	1 900	1 600	1 300	904	1 162	467	1 003	1 192	1 487	1 609	1 478	1 652	1 414	1 225
-animal feed	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	5 114	5 511	5 432	5 340	5 305
-crush (oil and oilcake)	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	893 322	657 038	854 211	704 960	756 919
Withdrawn by producers	1 500	2 000	1 900	4 900	5 700	1 700	3 500	2 521	2 524	1 068	1 157	605	442	519	783	464	287	1 358
Released to end-consumers	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	1 764	1 023	1 144	970	2 490
Seed for planting purposes	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	3 582	2 447	2 493	2 187	2 975
Net receipts(-)/disp(+)	900	1 500	0	1 000	-400	1 000	-1 200	-1 716	606	1 081	1 709	2 828	1 770	- 378	635	1 063	576	640
Deficit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	0	100	0	79 400	0	100	0	27	8	48	256	205	274	515	576	1 140	200	305
Total Demand	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	906 047	669 491	867 599	715 934	771 218
Ending Stock (28 Feb)	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	120 165	135 325	60 964	31 883	101 056
- processed p/month	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	75 004	55 336	71 775	64 701	63 621
- months' stock	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	1.6	2.4	0.8	0.5	1.6

Note: *** Figures for current season up to date

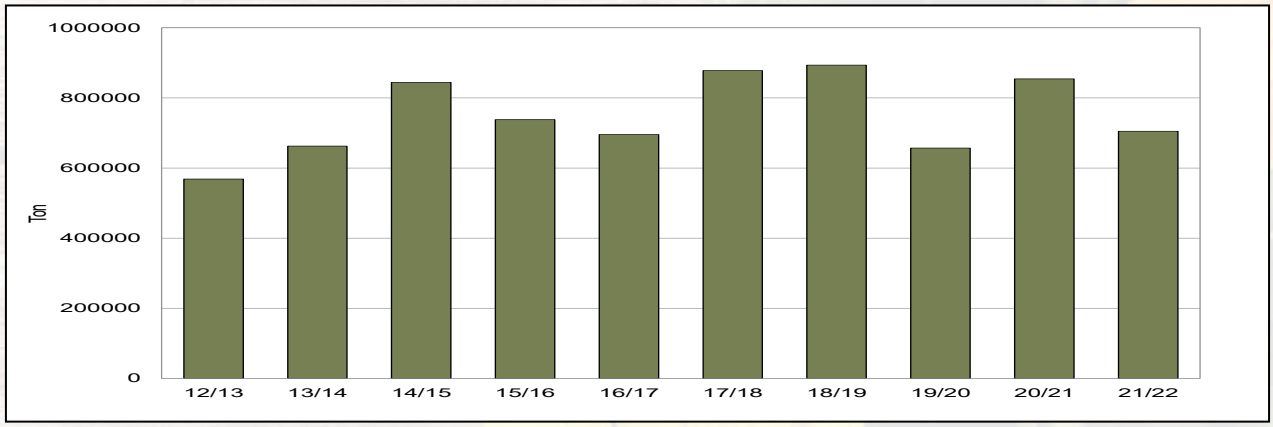
Graph 12: Sunflower: CEC Estimate vs SAGIS deliveries over 10 marketing seasons



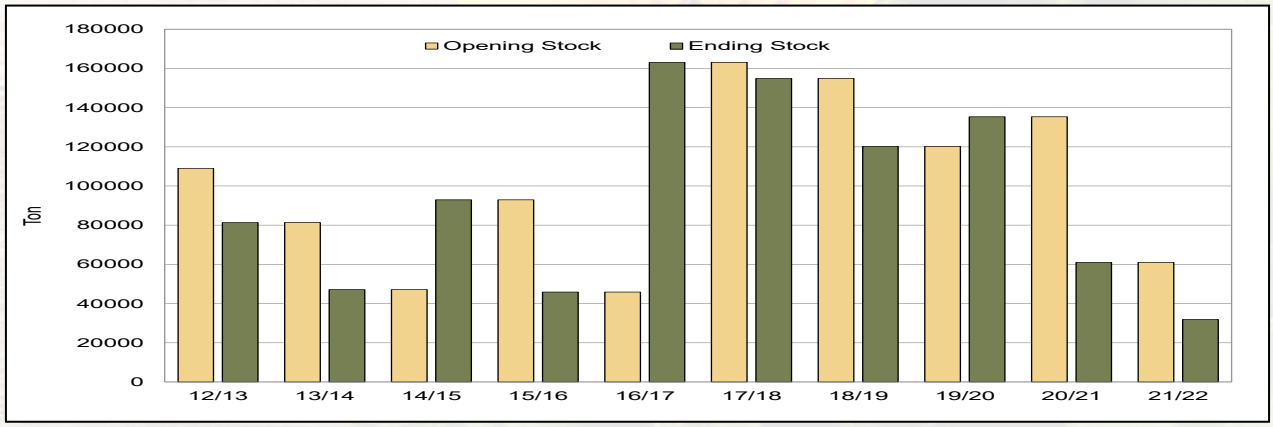
Graph 13: Sunflower: Imports and Exports over 10 marketing seasons



Graph 14: Sunflower: Crushed over 10 marketing seasons



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



Information provided by SAGIS.

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

Season	WHOLE SUNFLOWER: IMPORTS FOR RSA PER COUNTRY (TONS)												
	Argentina	Botswana	Brazil	Bulgaria	China	Egypt	Malawi	Mozambique	Romania	Ukraine	United Kingdom	Zambia	Total
2016/17	42	1 424	0	38 434	0	0	686	0	30 015	19	23	0	70 643
2017/18	21	0	0	0	18	44	429	19	0	0	23	0	554
2018/19	65	381	0	0	0	23	855	0	0	0	0	0	1 324
2019/20	44	0	0	0	0	23	390	0	0	0	0	0	457
2020/21	87	0	20	0	0	90	274	0	0	0	0	0	471
2021/22	43	1 003	0	3	0	184	23	0	0	0	0	0	1 256

Season	SUNFLOWER: IMPORTS PER HARBOUR (TONS)					
	Harbours					
	East London	Durban	Cape	Port Elizabeth	Richards Bay	Total
2007/08	0	19	0	0	0	19
2008/09	0	0	0	0	0	0
2009/10	0	66 547	0	0	0	66 547
2010/11	0	50 209	0	0	0	50 209
2011/12	0	0	0	0	0	0
2012/13	0	0	0	0	0	0
2013/14	0	92 832	0	0	0	92 832
2014/15	0	57 842	0	0	0	57 842
2015/16	0	30 611	0	0	0	30 611
2016/17	0	68 533	0	0	0	68 533
2017/18	0	44	62	0	0	106
2018/19	0	88	0	0	0	88
2019/20	0	67	0	0	0	67
2020/21	0	132	65	0	0	197
2021/22*	0	135	95	0	0	230

*Progressive March 2021 - January 2022
Note: Includes Imports for RSA and Other Countries

Season	WHOLE SUNFLOWER: RSA EXPORTS PER COUNTRY (TONS)						
	Australia	Botswana	Namibia	Eswatini	Uganda	Zimbabwe	Total
2016/17	0	40	48	107	0	10	205
2017/18	0	23	136	115	0	0	274
2018/19	0	10	360	145	0	0	515
2019/20	0	95	341	140	0	0	576
2020/21	0	24	304	192	54	566	1 140
2021/22	0	18	65	117	0	0	200

Season	SUNFLOWER: EXPORTS PER HARBOUR (TONS)					
	Harbours					
	East London	Durban	Cape	Port Elizabeth	Richards Bay	Total
2007/08	0	0	0	0	0	0
2008/09	34 870	44 555	0	0	0	79 425
2009/10	0	0	0	0	0	0
2010/11	0	0	0	0	0	0
2011/12	0	0	0	0	0	0
2012/13	0	0	0	0	0	0
2013/14	0	0	0	0	0	0
2014/15	0	22	0	0	0	22
2015/16	0	0	0	0	0	0
2016/17	0	0	0	0	0	0
2017/18	0	0	0	0	0	0
2018/19	0	0	0	0	0	0
2019/20	0	0	0	0	0	0
2020/21	0	0	0	0	0	0
2021/22*	0	0	0	0	0	0

*Progressive March 2021 - January 2022

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 2019 - Feb 2020 Progressive: 12 Months	Marketing year Mar 2020 - Feb 2021 Progressive: 12 Months	Mar 2021 Tons	Apr 2021 Tons	May 2021 Tons	June 2021 Tons	July 2021 Tons	Aug 2021 Tons	Sep 2021 Tons	Oct 2021 Tons	Nov 2021 Tons	Dec 2021 Tons	Jan 2022 Tons	Marketing year Mar 2021 - Feb 2022 Progressive: 11 Months
Palm Oil and Derivatives	**0**	**0**	0	0	0	0	0	0	0	0	0	0	0	**0**
Soybean Oil	**220 307**	**214 912**	11 363	21 942	23 481	20 516	21 515	20 867	25 161	24 611	22 815	23 009	23 593	**238 873**
Sunflower Oil	**234 557**	**305 099**	23 099	26 180	32 005	36 678	27 480	27 680	24 309	26 868	20 881	10 875	3 498	**259 553**
Coconut Oil/ Groundnut Oil / Canola Oil / Corn (Maize) Oil / Blends or mixes of Oils which includes one of the above Oils / Biodiesel / Cottonseed Oil	**47 910**	**48 762**	5 271	5 557	3 899	6 019	5 501	6 050	6 211	6 270	5 985	4 393	6 936	**62 092**
Sunflower Oilcake	**276 766**	**351 190**	26 499	28 731	36 503	41 428	31 911	30 399	28 918	29 019	24 043	11 072	6 503	**295 026**
Coconut Oilcake	**0**	**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	**0**
Soybean Oilcake / Canola Oil-cake / Cottonseed Oilcake	**1 022 415**	**1 005 161**	52 584	101 341	105 142	97 314	100 452	102 898	123 999	116 626	109 391	104 001	113 151	**1 126 899**
Soybean Flours and Meals / Textured Vegetable Protein	**39 785**	**38 724**	2 808	3 081	4 015	2 958	3 997	2 896	3 981	3 537	3 944	3 304	3 607	**38 128**
Soybean Fullfat	**194 228**	**148 918**	10 012	12 602	12 402	15 830	17 128	15 641	14 339	12 480	15 091	13 136	16 004	**154 665**
Peanut Butter and Paste	**28 026**	**37 131**	3 197	2 881	2 858	3 050	2 628	2 593	3 562	2 515	3 476	2 144	1 972	**30 876**
Total	**2 063 994**	**2 149 897**	**134 833**	**202 315**	**220 305**	**223 793**	**210 612**	**209 024**	**230 480**	**221 926**	**205 626**	**171 934**	**175 264**	**2 206 112**

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 2019 - Feb 2020 Progressive: 12 Months	Marketing year Mar 2020 - Feb 2021 Progressive: 12 Months	Mar 2021 Tons	Apr 2021 Tons	May 2021 Tons	June 2021 Tons	July 2021 Tons	Aug 2021 Tons	Sep 2021 Tons	Oct 2021 Tons	Nov 2021 Tons	Dec 2021 Tons	Jan 2022 Tons	Marketing year Mar 2021 - Feb 2022 Progressive: 11 Months
Palm Oil and Derivatives	**534 456**	**528 067**	39 501	54 159	56 770	36 203	47 836	44 699	41 587	51 782	28 992	35 466	52 494	**489 489**
Soybean Oil	**90 934**	**119 019**	3 300	9 477	5 000	9 668	4 634	1 860	7 413	5 659	14 494	1 110	4 720	**67 335**
Sunflower Oil	**244 099**	**136 571**	295	355	232	0	96	96	9 352	11 873	23 069	20 830	34 036	**100 234**
Coconut Oil/ Groundnut Oil / Canola Oil / Corn (Maize) Oil / Blends or mixes of Oils which includes one of the above Oils / Biodiesel / Cottonseed Oil	**14 386**	**12 702**	1 832	452	512	423	1 108	706	218	1 122	667	860	1 697	**9 597**
Sunflower Oilcake	**118 791**	**7 049**	119	0	0	0	0	0	232	9 125	8 747	36 034	705	**54 962**
Coconut Oilcake	**0**	**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	**0**
Soybean Oilcake / Canola Oil-cake / Cottonseed Oilcake	**463 478**	**401 851**	32 407	64 371	37 770	41 064	0	52 967	16 590	38 938	44 273	44 523	4 929	**377 832**
Soybean Flours and Meals / Textured Vegetable Protein	**0**	**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	**0**
Peanut Butter and Paste	**1 391**	**1 503**	96	204	62	46	0	142	163	154	151	204	177	**1 399**
Total	**1 467 535**	**1 206 762**	**77 550**	**129 018**	**100 346**	**87 404**	**53 674**	**100 470**	**75 555**	**118 653**	**120 393**	**139 027**	**98 758**	**1 100 848**

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 2019 - Feb 2020 Progressive: 12 Months	Marketing year Mar 2020 - Feb 2021 Progressive: 12 Months	Mar 2021 Tons	Apr 2021 Tons	May 2021 Tons	June 2021 Tons	July 2021 Tons	Aug 2021 Tons	Sep 2021 Tons	Oct 2021 Tons	Nov 2021 Tons	Dec 2021 Tons	Jan 2022 Tons	Marketing year Mar 2021 - Feb 2022 Progressive: 11 Months
Palm Oil and Derivatives	**16 078**	**12 476**	744	565	968	1 321	1 380	2 422	2 365	1 252	962	917	799	**13 695**
Soybean Oil	**17 619**	**44 035**	2 648	3 405	3 866	2 992	8 274	2 688	5 009	6 734	3 530	4 289	4 756	**48 191**
Sunflower Oil	**3 067**	**3 200**	819	228	179	191	189	152	364	211	148	177	124	**2 782**
Coconut Oil/ Groundnut Oil / Canola Oil / Corn (Maize) Oil / Blends or mixes of Oils which includes one of the above Oils / Biodiesel / Cottonseed Oil	**933**	**6 679**	1 591	1 162	754	859	157	323	86	282	928	1 315	1 413	**8 870**
Sunflower Oilcake	**3 006**	**1 510**	324	374	60	102	132	122	136	32	105	105	133	**1 625**
Coconut Oilcake	**0**	**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	**0**
Soybean Oilcake / Canola Oil-cake / Cottonseed Oilcake	**10 520**	**11 547**	1 018	759	1 143	1 050	906	1 266	2 673	1 969	2 222	1 010	1 123	**15 139**
Soybean Flours and Meals / Textured Vegetable Protein	**4 108**	**5 267**	199	272	800	680	2 468	2 227	2 074	2 963	3 000	1 086	3 000	**18 769**
Soybean Fullfat	**2 723**	**2 742**	229	102	300	238	340	204	204	176	170	547	200	**2 710**
Peanut Butter and Paste	**274**	**228**	9	24	14	30	26	12	21	26	16	25	17	**220**
Total	**58 328**	**87 684**	**7 581**	**6 891**	**8 084**	**7 463**	**13 872**	**9 416**	**12 932**	**13 645**	**11 081**	**9 471**	**11 565**	**112 001**

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.

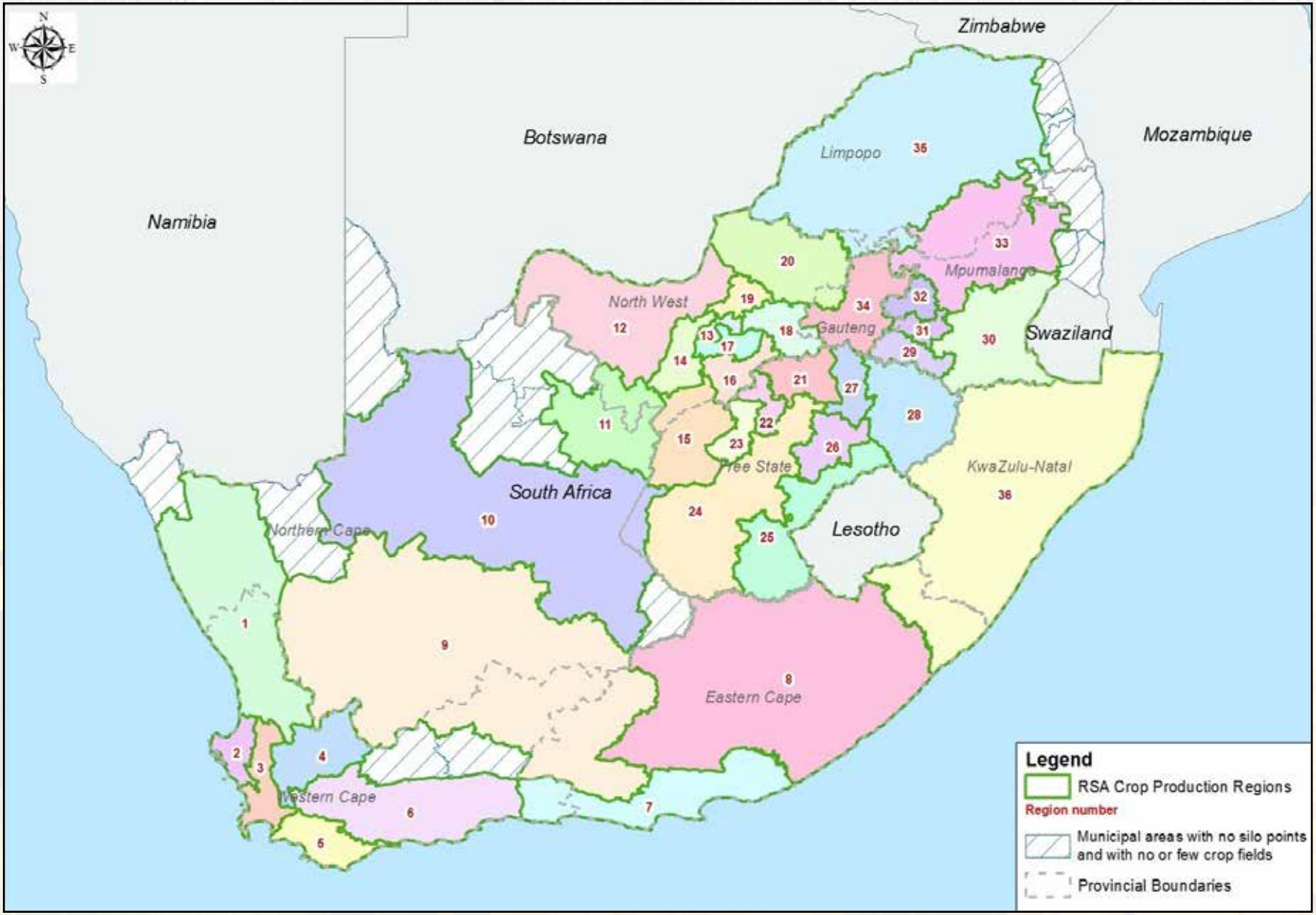
The 9 provinces are divided into 36 grain production regions.

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 2020/21 production season, are named and described on pages 15 to 17. All the silo/intake stands as well as the type of storage structure, situated in a particular region, are provided.

Figure 2: RSA Crop Production Regions



Regional map with gratitude to Agbiz Grain and SiQ.

Grain Production Regions

Silo/Intake stands per region indicating type of storage structure

Region 12: North West Western Region			
NWK	Blaauwbank (Bins)	NWK	Mareetsane (Bins)
NWK	Bührmannsdrif (Bins)	Senwes	Kameel (Bins)
NWK	Kameel (Bins)	Senwes	Vryburg (Bins)

Region 13: North West Central Region (Sannieshof)			
NWK	Biesiesvlei (Bins)	NWK	Oppaslaagte (Bins)
NWK	Bossies (Bins)	NWK	Sannieshof (Bins)
NWK	Gerdau (Bins)		

Region 14: North West Southern Region			
NWK	Barberspan (Bins)	NWK	Taaibospan (Bins)
NWK	Delareyville (Bins)	Senwes	Amalia (Bins)
NWK	Excelsior (Bins)	Senwes	Hallatshope (Bins)
NWK	Geysdorp (Bins)	Senwes	Migdol (Bins)
NWK	Migdol (Bins)	Senwes	Schweizer-Reneke (Bins)
NWK	Nooitgedacht (Bins)		

Region 16: North West Central-Eastern Region			
Senwes	Klerksdorp (Bins)	Senwes	Makwassie (Bins)
Senwes	Regina (Bins)	Senwes	Strydpoort (Bins)
Senwes	Bamboesspruit (Bins)	Senwes	Wolmaranstad (Bins)
Senwes	Leeudoringstad (Bins)		

Region 17: North West Central-Northern Region (Ottosdal)			
NWK	Boschpoort (Bags/Bins/Bulk)	NWK	Vermaas (Bins)
NWK	Kleinharts (Bins)	Senwes	Hartbeesfontein (Bins)
NWK	Ottosdal (Bins)	Senwes	Melliodora (Bins)
NWK	Rostrataville (Bins)	Senwes	Werda (Bins)

Region 18: North West Central Region (Ventersdorp)			
NWK	Bodenstein (Bins)	Senwes	Makokskraal (Bins)
NWK	Coligny (Bins)	Senwes	Potchefstroom (Bins)
Senwes	Buckingham (Bins)	Senwes	Ventersdorp (Bins)
Senwes	Enselspruit (Bins)		

Region 19: North West Central Region (Lichtenburg)			
Afgri	Lichtenburg (Bunkers)	NWK	Lottie Halte (Bins)
NWK	Grootpan (Bins)	NWK	Lusthof (Bins)
NWK	Halfpad (Bins)	NWK	Lichtenburg Silo 3 (Bins)
NWK	Hibernia (Bins)	NWK	Lichtenburg Silo 5 (Bins)

Region 20: North West Eastern Region			
Afgri	Battery (Bins)	NWK	Koster (Bins)
Afgri	Brits (Bins)	NWK	Swartruggens (Bins)
NWK	Boons (Bins)	NWK	Syferbult (Bins)
NWK	Derby (Bins)		

Grain Production Regions

Silo/Intake stands per region indicating type of storage structure

Region 21: Free State North-Western Region (Viljoenskroon)			
Senwes	Attie (Bins)	Senwes	Vierfontein (Bins)
Senwes	Groenebloem (Bins)	Senwes	Viljoenskroon (Bins)
Senwes	Heuningspruit (Bins)	Senwes	Vredefort (Bins)
Senwes	Koppies (Bins)	Senwes	Weiveld (Bins)
Senwes	Rooiwal (Bins)		

Region 22: Free State North-Western Region (Bothaville)			
Senwes	Allanrigde (Bins)	Senwes	Schoonspruit (Bins)
Senwes	Bothaville (Bins)	Senwes	Schuttesdraai (Bins)
Senwes	Mirage (Bins)	Suidwes	Misgunst (Bunkers)
Senwes	Odendaalsrus (Bins)		

Region 23: Free State North-Western Region (Bultfontein)			
Senwes	Bultfontein (Bins)	Senwes	Tierfontein (Bins)
Senwes	Losdoorns (Bins)	Senwes	Wesselsbron (Bins)
Senwes	Protespan (Bins)	Senwes	Willemsrus (Bins)

Region 24: Free State Central Region			
Senwes	Bloemfontein (Bins)	Senwes	Petrusburg (Bins)
Senwes	Brandfort (Bins)	Senwes	Theunissen (Bins)
Senwes	De Brug (Bins)	Senwes	Van Tonder (Bins)
Senwes	Geneva (Bins)	Senwes	Welgeleë (Bins)
Senwes	Hennenman (Bins)	Senwes	Winburg (Bins)
Senwes	Kroonstad (Bins)		

Region 25: Free State South-Western Region			
Afgri	Bethlehem (Bins)	OVK	Marseilles (Bins)
Afgri	Slabberts (Bins)	OVK	Modderpoort (Bins)
OVK	Clocolan (Bins)	OVK	Tweespruit (Bins)
OVK	Ficksburg (Bins)	OVK	Westminster (Bins)
OVK	Fouriesburg (Bins)		

Region 26: Free State South-Eastern Region			
Afgri	Kaallaagte (Bins)	Afgri	Monte Video (Bins)
Afgri	Libertas (Bins)	Afgri	Senekal (Bins)
Afgri	Marquard (Bins)	Senwes	Arlington (Bins)
Afgri	Meets (Bins)	Senwes	Steynsrus (Bins)

Region 27: Free State Northern Region			
Senwes	Gottenburg (Bins)	Senwes	Mooigeleë (Bins)
Senwes	Heilbron (Bins)	Senwes	Wolwehoek (Bins)
Senwes	Hoogte Grainlink (Bins)	VKB	Petrus Steyn (Bins)

Grain Production Regions

Silo/Intake stands per region indicating type of storage structure

Region 28: Free State Eastern Region			
Afgri	Afrikaskop (Bins/Bunkers)	VKB	Jim Fouché (Bins)
Afgri	Eeram (Bins)	VKB	Memel (Bins)
Afgri	Harrismith (Bins)	VKB	Reitz (Bins)
Afgri	Kransfontein (Bins/Bunkers)	VKB	Tweeling (Bins)
VKB	Ascent (Bins)	VKB	Villiers (Bins/Bulk)
VKB	Cornelia (Bins)	VKB	Vrede (Bins)
VKB	Daniëlsrus (Bins)	VKB	Warden (Bins)
VKB	Frankfort (Bins)	VKB	Windfield (Bins)

Region 29: Mpumalanga Southern Region			
Afgri	Balfour (Bins)	Afgri	Leeuspruit (Bins)
Afgri	Greylingstad (Bins)	Afgri	Platrand (Bins)
Afgri	Grootvlei (Bins)	Afgri	Standerton (Bins)
Afgri	Harvard (Bins)	Afgri	Val (Bins)
Afgri	Holmdene (Bins)		

Region 33: Mpumalanga Northern Region			
Afgri	Arnot (Bins)	Afgri	Middelburg (Bins)
Afgri	Driefontein (Bins)	Afgri	Pan (Bins)
Afgri	Lydenburg (Bins)	Afgri	Stoffberg (Bins)
Afgri	Marble Hall (Bins)	Afgri	Wonderfontein (Bins)

Region 34: Gauteng Region			
Afgri	Bloekomspruit (Bins)	Afgri	Nigel (Bins)
Afgri	Bronkhorstspruit (Bins)	Afgri	Pretoria Wes (Bins)
Afgri	Glenroy (Bins)	Afgri	Vogelvallei (Bunkers)
Afgri	Goeie Hoek (Bins)	Senwes	Middelvlei (Bins)
Afgri	Kaalfontein (Bins)	Senwes	Oberholzer (Bins)
Afgri	Kliprivier (Bunkers)	Senwes	Raathsvlei (Bins)
Afgri	Meyerton (Bunkers)		

Region 35: Limpopo Region			
Afgri	Northam (Bins)	VKB	Nylstroom (Modimolle) (Bins)
VKB	Alma (Bins)	VKB	Potgietersrus (Mokopane) (Bins)
VKB	Lehau (Bins)	VKB	Roedtan (Bins)
VKB	Naboomspruit (Mookgophong) (Bins)	VKB	Settlers (Bins)
VKB	Nutfield (Bins)	VKB	Warmbad (Bela-Bela) (Bins)

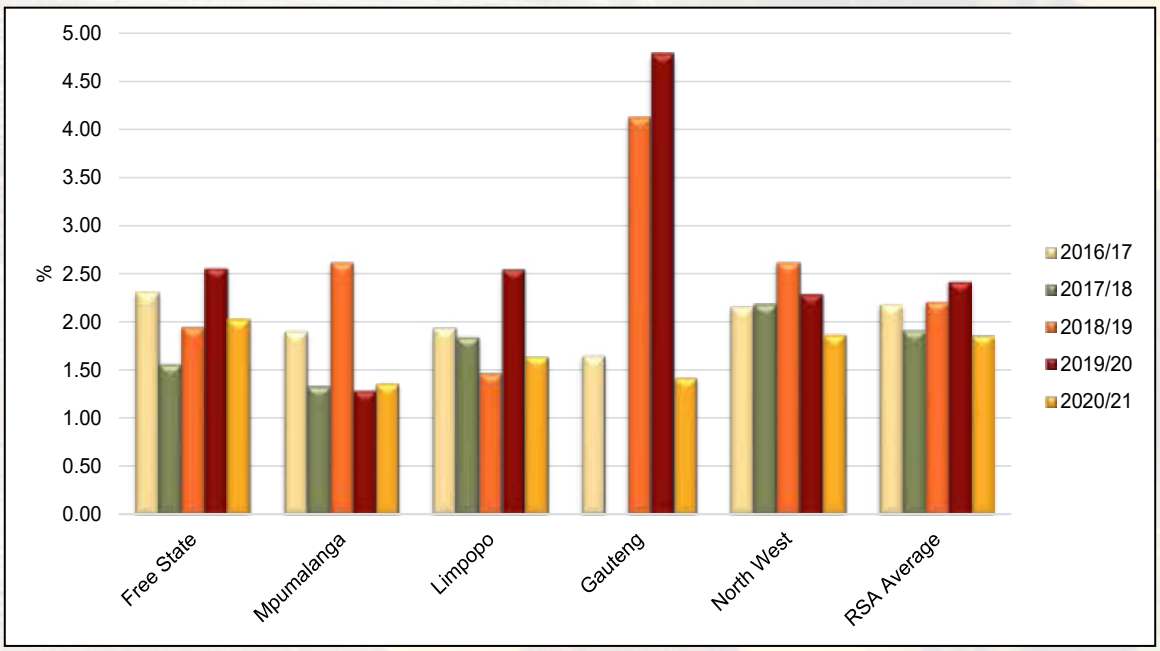
Sunflower Crop Quality 2020/21 - Summary of results

Eighty-three percent (131) of the 157 samples analysed for the purpose of this survey were graded as Grade FH1, with 26 (17%) of the samples downgraded to COSF (Class Other Sunflower Seed). The percentage FH1 samples is in line with earlier seasons (2017/18 and earlier). Samples received during the previous two seasons, had the highest percentages samples (37% and 24% respectively) downgraded to Class Other, since commencement of the sunflower crop surveys in 2012/13.

- Six (23%) of the samples downgraded this season was as a result of the percentage screenings exceeding the maximum permissible deviation of 4%.
- One sample (4%) was downgraded as a result of the percentage foreign matter exceeding the maximum permissible deviation of 4%.
- Two samples (8%) were downgraded as a result of the percentage collective deviations exceeding the maximum permissible deviation of 6%.
- Eight samples in total (31%) were downgraded as a result of the presence of poisonous seeds. Seven samples were downgraded due to the presence of *Datura sp.* exceeding the maximum permissible number, namely 1 per 1000 g. Another sample was downgraded due to *Ipomoea purpurea* Roth. (morning glory) seeds exceeding 7 per 1000 g.
- The remaining 34% of samples (9) were downgraded as a result of a combination of one or more of the following deviations exceeding the maximum permissible deviation: screenings, foreign matter and collective deviations.

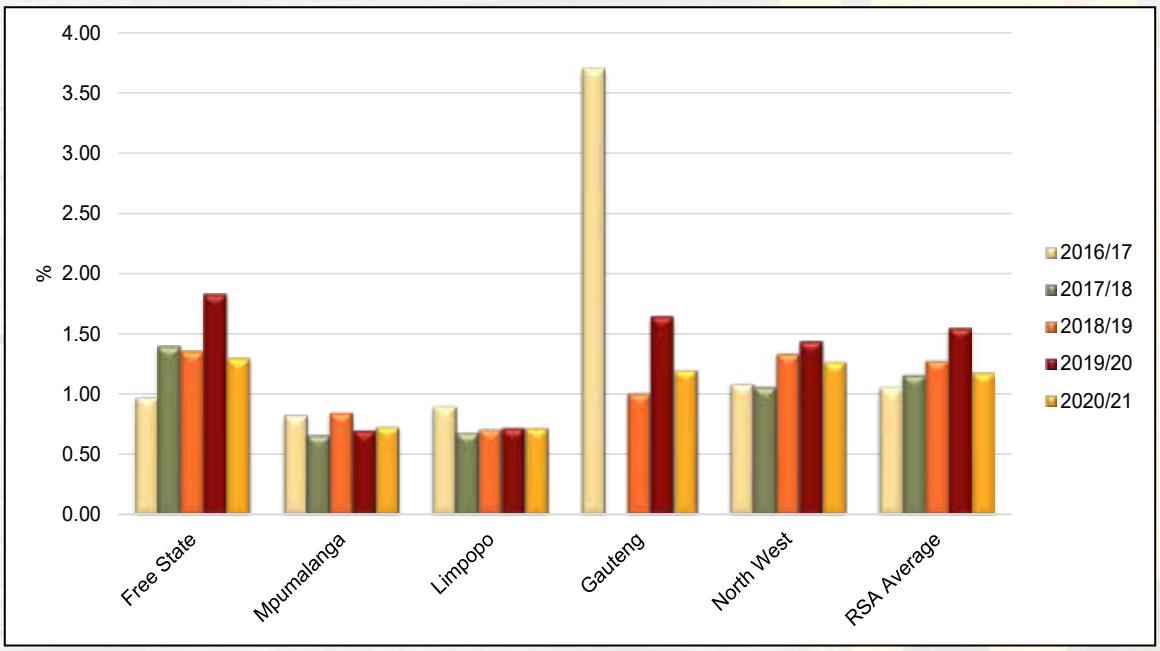
The samples from the Free State province (N = 45) reported the highest average percentage screenings namely 2.03%, followed by North West (N = 85) and Limpopo (N = 19) with 1.87% and 1.64% respectively. The single sample from Gauteng reported 1.42% and Mpumalanga's seven samples averaged the lowest percentage screenings of 1.36%. The weighted national average was 1.86% compared to the 2.42% of the previous season.

Graph 16: Average percentage screenings per province over five seasons



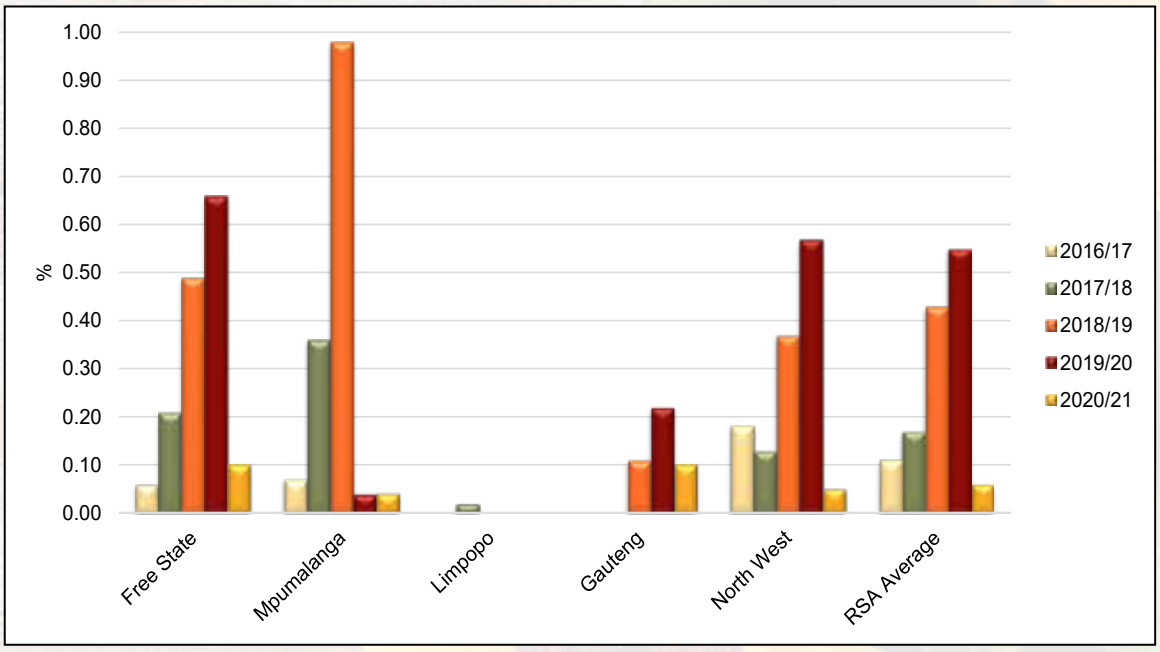
The highest weighted average percentage foreign matter (1.30%) was reported for the Free State province's regions. North West and Gauteng followed closely with 1.27% and 1.20% respectively. The lowest percentages were found in Mpumalanga (0.73%) and Limpopo (0.72%). The national average was 1.18% compared to the 1.55% and 1.28% of the previous two seasons. Please see Graph 17.

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



The percentage of samples received for this survey that contained sclerotia from the fungus *Sclerotinia sclerotiorum*, decreased from 71% and 51% in the previous two seasons respectively, to 22% this season. 46% of these samples originated in North West province, 43% in the Free State, 8% in Mpumalanga and the single sample from Gauteng also reported sclerotia. None of the samples received exceeded the maximum permissible deviation of 4%. The national average of 0.06% is the lowest since the 2015/16 season. Last season's average was 0.55%.

Graph 18: Average percentage sclerotia per province over five seasons

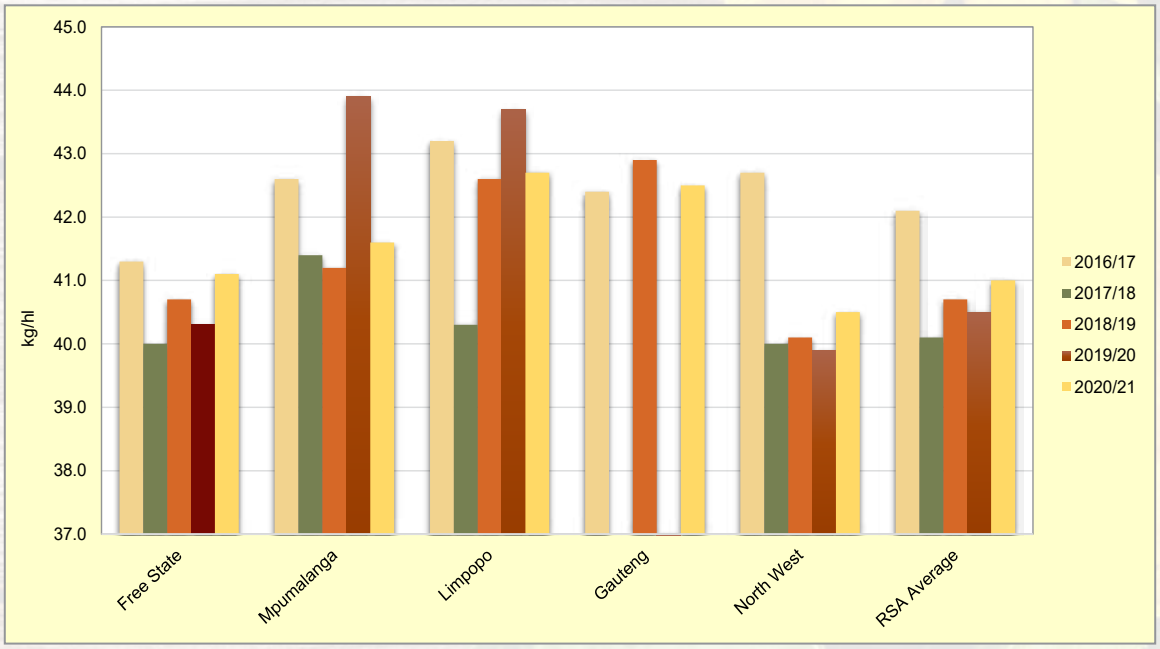


Test weight does not form part of the grading regulations for sunflower seed in South Africa. An approximation of the test weight of South African sunflower seed is provided in Table 3 for information purposes. The standard working procedure of the Kern 222 instrument, as described in ISO 7971-3:2019, 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								
	2020/21 Season			2019/20 Season			2018/19 Season		
	Weighted average	Range	No. of samples	Weighted average	Range	No. of samples	Weighted average	Range	No. of samples
Free State (Regions 21 - 28)	41.1	38.0 - 44.9	*44	40.3	27.3 - 47.3	84	40.7	33.1 - 46.8	95
Mpumalanga (Regions 29 - 33)	41.6	40.4 - 42.5	7	43.9	43.7 - 44.0	6	41.2	39.8 - 42.8	8
Limpopo (Region 35)	42.7	40.5 - 44.4	19	43.7	38.7 - 47.4	13	42.6	37.8 - 45.4	12
Gauteng (Region 34)	42.5	-	1	34.2	-	1	42.9	42.5 - 43.6	3
North West (Region 12 - 20)	40.5	30.4 - 43.7	85	39.9	30.9 - 48.4	72	40.1	30.9 - 46.5	58
RSA	***41.0***	***30.4 - 44.9***	***156***	***40.5***	***27.3 - 48.4***	***176***	***40.7***	***30.9 - 46.8***	***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



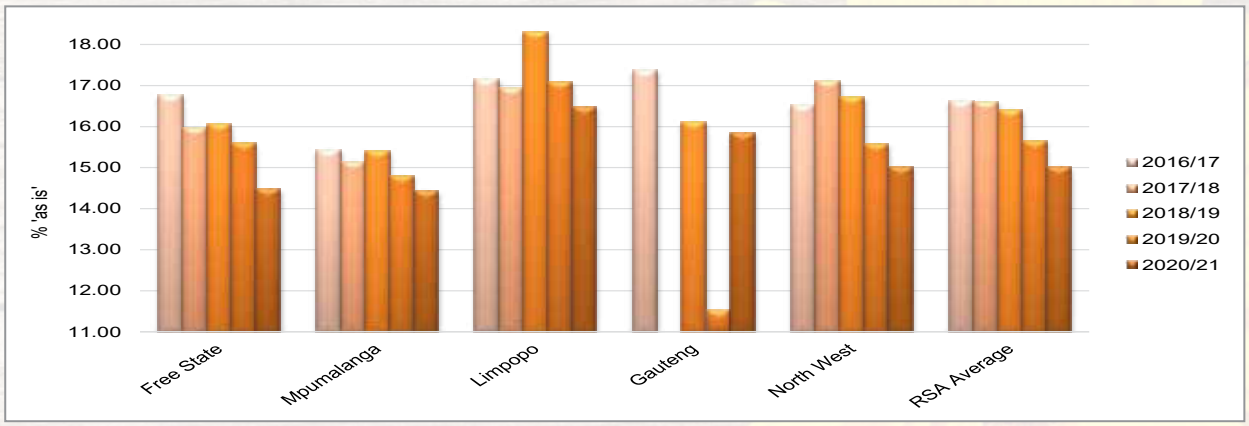
The nutritional component analyses, namely crude protein, -fat, -fibre and ash are reported as % (g/100 g) on an 'as received' or 'as is' basis.

The weighted average crude protein content this season was 15.02% and the lowest of the nine seasons for which crop survey results are available. The previous season's average was the second lowest at 15.66%. Limpopo had the highest weighted average crude protein content of 16.47%, followed by the sample from Gauteng with 15.84% and North West with an average of 15.02%. The Free State averaged 14.49% and Mpumalanga 14.42%. The weighted average crude fat percentage was 39.5%, the highest since the 2014/15 season and also the third highest average since the commencement of the survey. Last season averaged 38.7%. North West had the highest weighted average crude fat content of 39.7%, followed by the Free State with 39.5% and Mpumalanga 39.4%. Gauteng and Limpopo averaged 38.9% and 38.3% respectively.

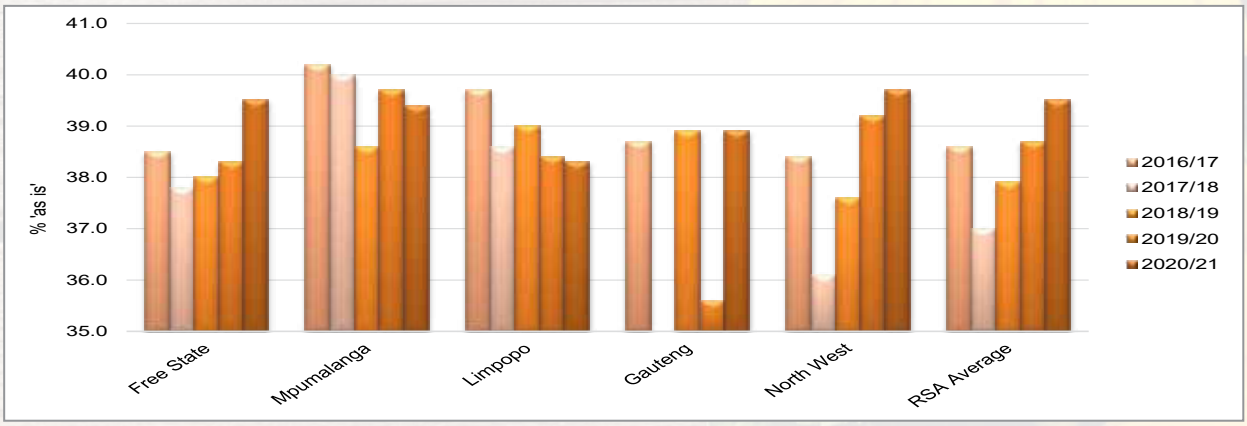
The weighted average percentage crude fibre was 21.8%, just slightly lower than the 21.9% of the previous season. Average values varied from a low of 21.4% in both North West and Limpopo to 22.3% in the Free State and 24.0% in Mpumalanga. The weighted average ash content was 2.53%, the second lowest of the last nine seasons. The 2019/20 season averaged 2.65%. The provincial averages ranged from 2.27% in Mpumalanga to 2.58% in the Free State.

Graphs 20 to 23 on page 21 provide comparisons between provinces and over seasons for the nutritional components discussed above.

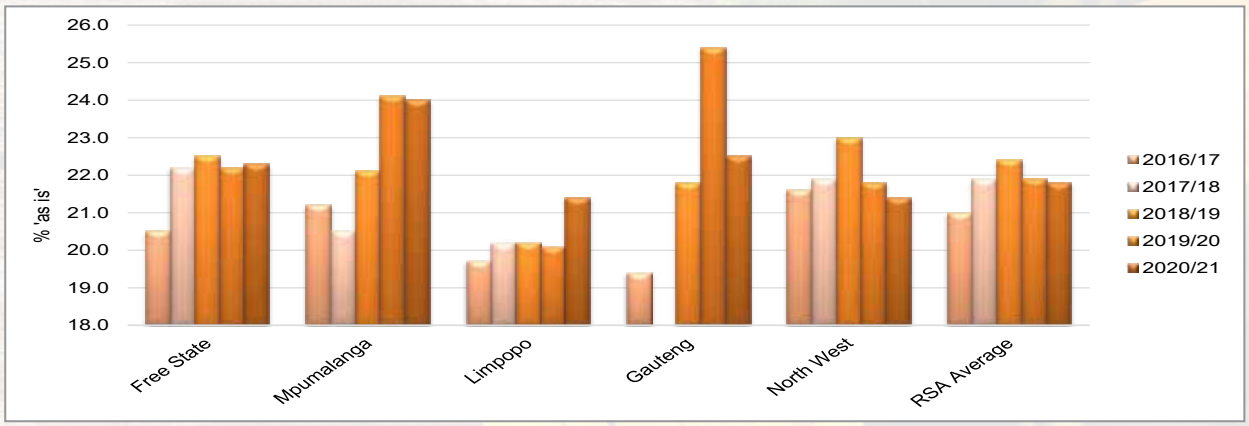
Graph 20: Average crude protein content per province over five seasons



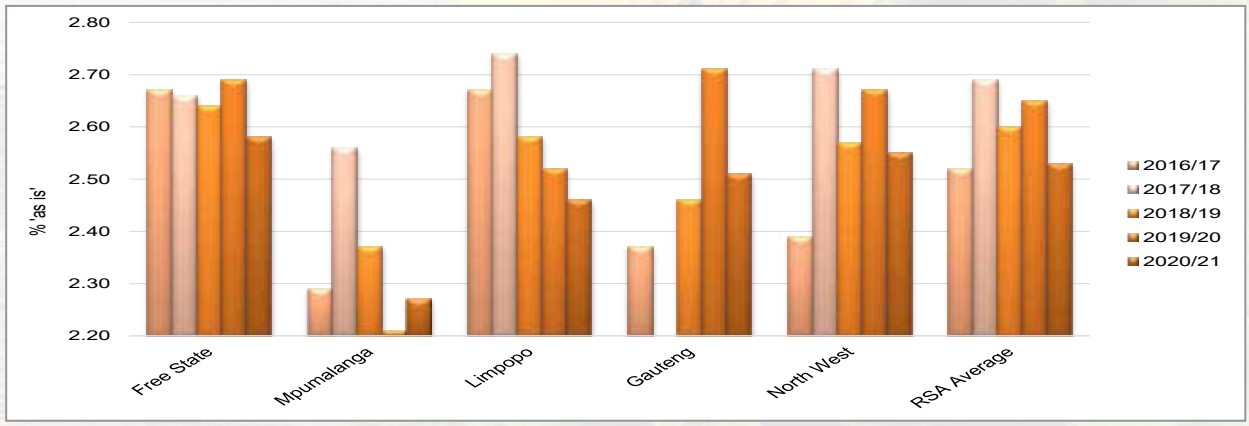
Graph 21: Average crude fat content per province over five seasons



Graph 22: Average crude fibre content per province over five seasons



Graph 23: Average ash content per province over five seasons



Please see a comparison of the moisture, crude protein and crude fat results between the crop survey and ARC Grain Crops sunflower cultivar trials' samples in Table 4.

Table 4: Comparison between the moisture, crude protein and crude fat results of the sunflower crop quality and ARC cultivar trial samples of the 2020/21 season

Analysis	Moisture, % (5hr, 105°C)	Crude Protein, % (as is)	Crude Fat, % (as is)
Sunflower Crop Quality Survey results			
Average	5.0	15.02	39.5
Minimum	3.9	11.41	33.3
Maximum	6.9	18.04	46.1
Standard deviation	0.53	1.22	1.89
No. of samples	***157***	***157***	***157***
ARC Grains Crops Cultivar trial sample results			
Average	5.3	15.84	40.4
Minimum	3.2	11.44	25.6
Maximum	7.6	22.95	53.8
Standard deviation	0.88	2.42	7.22
No. of samples	***104***	***104***	***104***
% Difference between crop and cultivar samples	***-0.3***	***-0.82***	***-0.9***

See Table 5 on page 23 for a summary of the RSA Sunflower Crop Quality averages of the 2020/21 season compared to those of the 2019/20 season.

Please also see pages 24 to 30 for the average sunflower quality per region.

Table 5: South African Sunflower Crop Quality Averages 2020/21 vs 2019/20						
Class and Grade Sunflower	**2020/21**			**2019/20**		
	FH1	**COSF**	**Average**	**FH1**	**COSF**	**Average**
Grading:						
1. Damaged sunflower seed, %	0.05	0.03	0.05	0.10	1.52	0.63
2. Screenings, %	1.55	3.41	1.86	1.68	3.69	2.42
3. Sclerotia, %	0.05	0.13	0.06	0.38	0.84	0.55
4. Foreign Matter, %	1.01	2.07	1.18	0.98	2.52	1.55
5. Deviations in 2,3 and 4 collectively, %: Provided that such deviations are individually within the limits of said items	2.61	5.61	3.11	3.04	7.05	4.52
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	3	1	0	3	1
Poisonous seeds (*Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.*)	0	1	0	0	0	0
Number of samples	***131***	***26***	***157***	***111***	***65***	***176***
Nutritional analysis:						
Moisture, % (5 hr, 105 °C)	5.0	4.9	5.0	4.7	4.8	4.8
Crude Protein, % (as is)	15.12	14.56	15.02	15.74	15.51	15.66
Crude Fat, % (as is)	39.5	39.1	39.5	39.1	38.2	38.7
Crude Fibre, % (as is)	21.7	22.22	21.8	21.6	22.5	21.9
Ash, % (as is)	2.54	2.52	2.53	2.63	2.70	2.65
Number of samples	***131***	***26***	***157***	***111***	***65***	***176***

REGIONAL SUNFLOWER QUALITY

PRODUCTION REGION	(12) North-West Western Region				(13) North-West Central Region (Sannieshof)				(14) North-West Southern Region			
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	0.13	0.00	2.04	0.43	0.00	0.00	0.00	0.00
2. Screenings, %	1.09	0.44	1.46	0.30	1.62	0.66	3.12	0.60	1.87	0.72	4.40	1.25
3. Sclerotia, %	0.00	0.00	0.00	0.00	0.11	0.00	0.90	0.22	0.01	0.00	0.10	0.03
4. Foreign Matter, %	0.77	0.28	1.62	0.43	1.17	0.24	2.50	0.59	0.83	0.22	1.90	0.40
5. Deviations in 2, 3 and 4 collectively, %: Provided that such deviations are individually within the limits of said items	1.86	1.08	2.90	0.53	2.90	1.80	5.22	0.79	2.72	0.94	5.02	1.25
Poisonous seeds *(Crotalaria sp., Datura sp., Ricinis communis)*	1	0	10	3.54	0	0	10	2.09	0	0	5	1.29
Poisonous seeds *(Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.)*	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
Number of samples	***8***				***23***				***15***			
Nutritional analysis:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
Moisture, % (5 hr, 105 °C)	4.7	4.4	5.1	0.22	5.0	4.2	5.9	0.44	5.0	4.0	5.8	0.57
Crude Protein, % (as is)	14.82	12.90	15.45	0.83	15.42	14.00	16.87	0.66	14.61	12.19	17.07	1.38
Crude Fat, % (as is)	39.9	34.8	46.1	3.13	40.1	35.2	42.3	1.93	40.1	37.3	42.4	1.67
Crude Fibre, % (as is)	21.8	19.3	23.1	1.34	21.7	19.4	24.1	1.32	21.3	18.8	23.7	1.39
Ash, % (as is)	2.61	2.39	2.92	0.19	2.57	2.24	2.71	0.11	2.55	2.36	2.82	0.13
Number of samples	***8***				***23***				***15***			

REGIONAL SUNFLOWER QUALITY

PRODUCTION REGION	(16) North-West Central-Eastern Region				(17) North-West Central-Northern Region (Ottosdal)				(18) North-West Central Region (Ventersdorp)			
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	0.03	0.00	0.36	0.10	0.06	0.00	0.42	0.16
2. Screenings, %	1.99	1.50	2.48	0.69	1.61	0.16	2.80	0.64	1.26	0.66	2.00	0.42
3. Sclerotia, %	0.03	0.00	0.06	0.04	0.02	0.00	0.20	0.06	0.00	0.00	0.00	0.00
4. Foreign Matter, %	0.97	0.70	1.24	0.38	0.99	0.10	2.22	0.65	1.23	0.76	2.60	0.64
5. Deviations in 2, 3 and 4 collectively, %: Provided that such deviations are individually within the limits of said items	2.99	2.80	3.18	0.27	2.62	0.26	4.40	1.15	2.49	1.82	4.60	0.98
Poisonous seeds *(Crotalaria sp., Datura sp., Ricinis communis)*	0	0	0	0.00	1	0	10	2.77	0	0	0	0.00
Poisonous seeds *(Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.)*	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
Number of samples	***2***				***13***				***7***			
Nutritional analysis:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
Moisture, % (5 hr, 105 °C)	4.8	4.7	4.9	0.14	5.1	3.9	5.9	0.59	5.2	4.6	5.7	0.34
Crude Protein, % (as is)	14.62	14.31	14.93	0.44	14.98	13.43	15.96	0.82	15.31	14.49	15.95	0.50
Crude Fat, % (as is)	41.1	40.7	41.4	0.49	40.3	38.1	44.8	1.84	39.3	36.5	40.8	1.58
Crude Fibre, % (as is)	20.5	20.4	20.6	0.14	20.3	18.1	21.9	1.41	20.8	19.2	23.1	1.69
Ash, % (as is)	2.64	2.56	2.71	0.11	2.61	2.44	2.71	0.08	2.57	2.43	2.72	0.12
Number of samples	***2***				***13***				***7***			

REGIONAL SUNFLOWER QUALITY

PRODUCTION REGION	(19) North-West Central Region (Lichtenburg)				(20) North-West Eastern Region				(21) Free State North-Western Region (Viljoenskroon)			
Grading:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
1. Damaged sunflower seed, %	0.05	0.00	0.36	0.13	0.10	0.00	0.40	0.20	0.14	0.00	1.12	0.40
2. Screenings, %	2.98	0.60	5.86	1.38	3.16	1.46	4.78	1.60	2.46	0.28	8.88	2.68
3. Sclerotia, %	0.04	0.00	0.20	0.08	0.24	0.00	0.84	0.41	0.03	0.00	0.10	0.05
4. Foreign Matter, %	2.73	0.80	6.00	1.77	0.78	0.42	1.10	0.29	1.15	0.40	2.00	0.58
5. Deviations in 2, 3 and 4 collectively, %: Provided that such deviations are individually within the limits of said items	5.76	1.64	11.86	2.92	4.17	1.88	6.16	2.00	3.63	1.04	10.76	3.09
Poisonous seeds *(Crotalaria sp., Datura sp., Ricinis communis)*	1	0	16	4.44	0	0	0	0.00	3	0	20	7.07
Poisonous seeds *(Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.)*	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
Number of samples	***13***				***4***				***8***			
Nutritional analysis:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
Moisture, % (5 hr, 105 °C)	5.4	5.0	6.0	0.35	5.6	4.9	6.9	0.93	5.3	4.9	5.6	0.22
Crude Protein, % (as is)	14.93	13.87	16.26	0.77	14.83	13.62	16.66	1.34	15.27	13.66	15.99	0.77
Crude Fat, % (as is)	38.5	36.0	41.2	1.84	38.2	33.3	40.6	3.32	39.4	37.7	41.3	1.35
Crude Fibre, % (as is)	22.5	19.5	24.8	1.70	21.0	20.0	22.9	1.37	22.0	19.5	24.1	1.31
Ash, % (as is)	2.54	2.33	2.77	0.12	2.15	2.05	2.34	0.13	2.53	2.21	2.78	0.18
Number of samples	***13***				***4***				***8***			

REGIONAL SUNFLOWER QUALITY

PRODUCTION REGION	(22) Free State North-Western Region (Bothaville)				(23) Free State North-Western Region (Bultfontein)				(24) Free State Central Region			
Grading:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
1. Damaged sunflower seed, %	0.06	0.00	0.32	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2. Screenings, %	1.54	0.72	2.68	0.74	1.69	0.16	2.88	1.37	2.20	0.82	5.06	1.29
3. Sclerotia, %	0.01	0.00	0.06	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.10	0.04
4. Foreign Matter, %	1.53	0.30	4.16	1.53	0.71	0.30	1.00	0.31	2.04	0.66	4.88	1.39
5. Deviations in 2, 3 and 4 collectively, %: Provided that such deviations are individually within the limits of said items	3.09	1.72	4.88	1.35	2.40	0.46	3.88	1.57	4.25	1.64	7.36	2.18
Poisonous seeds *(Crotalaria sp., Datura sp., Ricinis communis)*	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
Poisonous seeds *(Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.)*	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
Number of samples	***5***				***4***				***8***			
Nutritional analysis:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
Moisture, % (5 hr, 105 °C)	5.0	4.5	5.5	0.40	5.0	4.8	5.3	0.22	5.0	4.4	6.6	0.72
Crude Protein, % (as is)	14.99	13.97	15.86	0.73	14.65	13.01	15.95	1.44	14.29	13.16	15.78	0.92
Crude Fat, % (as is)	40.5	38.9	42.2	1.23	39.6	38.8	40.9	0.95	38.8	36.7	40.5	1.39
Crude Fibre, % (as is)	21.5	20.2	22.6	1.05	22.3	20.1	25.0	2.12	23.2	20.9	25.1	1.27
Ash, % (as is)	2.73	2.50	2.88	0.16	2.63	2.42	3.03	0.28	2.43	2.25	2.72	0.16
Number of samples	***5***				***4***				***8***			

REGIONAL SUNFLOWER QUALITY

PRODUCTION REGION	(25) Free State South-Western Region				(26) Free State South-Eastern Region				(27) Free State Northern Region			
Grading:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
1. Damaged sunflower seed, %	0.19	0.00	0.28	0.11	0.03	0.00	0.24	0.08	0.00	0.00	0.00	0.00
2. Screenings, %	1.80	0.84	3.70	1.12	1.83	0.46	5.30	1.48	2.32	1.32	4.56	1.51
3. Sclerotia, %	0.08	0.00	0.40	0.18	0.42	0.00	1.30	0.48	0.00	0.00	0.00	0.00
4. Foreign Matter, %	0.93	0.48	1.24	0.36	1.03	0.42	3.00	0.78	1.46	0.60	3.10	1.13
5. Deviations in 2, 3 and 4 collectively, %: Provided that such deviations are individually within the limits of said items	2.80	1.68	4.90	1.23	3.28	0.94	9.12	2.37	3.77	2.14	5.84	1.69
Poisonous seeds *(Crotalaria sp., Datura sp., Ricinis communis)*	0	0	0	0.00	1	0	10	3.33	0	0	0	0.00
Poisonous seeds *(Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.)*	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
Number of samples	***5***				***9***				***4***			
Nutritional analysis:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
Moisture, % (5 hr, 105 °C)	4.6	4.3	4.8	0.25	4.9	4.3	5.9	0.52	5.4	5.1	5.6	0.22
Crude Protein, % (as is)	12.94	12.38	13.83	0.57	13.77	11.74	15.58	1.23	16.03	15.19	16.67	0.62
Crude Fat, % (as is)	41.5	39.8	43.3	1.29	39.3	37.4	41.5	1.56	37.7	35.6	39.1	1.48
Crude Fibre, % (as is)	21.7	16.1	24.6	3.48	23.0	20.5	25.7	1.52	22.0	19.9	23.5	1.54
Ash, % (as is)	2.56	2.46	2.84	0.16	2.57	2.41	2.70	0.09	2.69	2.55	2.77	0.09
Number of samples	***5***				***9***				***4***			

South Africa

REGIONAL SUNFLOWER QUALITY

PRODUCTION REGION	(28) Free State Eastern Region				(29) Mpumalanga Southern Region				(33) Mpumalanga Northern Region			
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	0.00	0.00	0.00	0.00	0.08	0.00	0.24	0.14
2. Screenings, %	2.33	2.32	2.34	0.01	1.65	1.00	2.60	0.72	0.97	0.80	1.20	0.21
3. Sclerotia, %	0.05	0.00	0.10	0.07	0.05	0.00	0.10	0.06	0.03	0.00	0.10	0.06
4. Foreign Matter, %	1.28	1.00	1.56	0.40	0.73	0.50	0.80	0.15	0.72	0.20	1.30	0.55
5. Deviations in 2, 3 and 4 collectively, %: Provided that such deviations are individually within the limits of said items	3.66	3.42	3.90	0.34	2.43	1.70	3.50	0.81	1.72	1.10	2.10	0.54
Poisonous seeds *(Crotalaria sp., Datura sp., Ricinis communis)*	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
Poisonous seeds *(Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.)*	0	0	0	0.00	5	0	20	10.00	0	0	0	0.00
Number of samples	***2***				***4***				***3***			
Nutritional analysis:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
Moisture, % (5 hr, 105 °C)	5.1	5.1	5.1	0.00	4.9	4.6	5.1	0.21	4.6	4.2	5.0	0.40
Crude Protein, % (as is)	14.70	13.89	15.51	1.15	15.49	13.87	16.66	1.19	12.99	11.41	15.08	1.89
Crude Fat, % (as is)	39.8	39.5	40.1	0.42	39.2	38.2	41.7	1.69	39.7	38.6	41.9	1.88
Crude Fibre, % (as is)	20.9	20.7	21.0	0.21	22.9	21.5	23.8	0.97	25.4	24.4	27.1	1.46
Ash, % (as is)	2.70	2.64	2.76	0.08	2.36	2.28	2.42	0.06	2.14	1.99	2.40	0.22
Number of samples	***2***				***4***				***3***			

REGIONAL SUNFLOWER QUALITY

PRODUCTION REGION	(34) Gauteng Region				(35) Limpopo Region			
Grading:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
1. Damaged sunflower seed, %	0.00	-	-	-	0.01	0.00	0.18	0.04
2. Screenings, %	1.42	-	-	-	1.64	0.14	4.68	1.35
3. Sclerotia, %	0.10	-	-	-	0.00	0.00	0.00	0.00
4. Foreign Matter, %	1.20	-	-	-	0.72	0.12	1.60	0.41
5. Deviations in 2, 3 and 4 collectively, %: Provided that such deviations are individually within the limits of said items	2.72	-	-	-	2.36	0.42	5.28	1.42
Poisonous seeds *(Crotalaria sp., Datura sp., Ricinis communis)*	0	-	-	-	0	0	0	0.00
Poisonous seeds *(Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.)*	0	-	-	-	0	0	0	0.00
Number of samples	***1***				***19***			
Nutritional analysis:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
Moisture, % (5 hr, 105 °C)	5.1	-	-	-	4.4	4.0	6.4	0.56
Crude Protein, % (as is)	15.84	-	-	-	16.47	13.90	18.04	0.98
Crude Fat, % (as is)	38.9	-	-	-	38.3	36.3	41.2	1.34
Crude Fibre, % (as is)	22.5	-	-	-	21.4	19.8	23.5	1.07
Ash, % (as is)	2.51	-	-	-	2.46	2.03	2.90	0.21
Number of samples	***1***				***19***			

Fatty acid Profile

Fatty acid profiles are the most important tool for identification of authenticity of vegetable fats and oils. All types of oil have their own specific fatty acid profile which is unique to that product. Fatty acids are typically esterified to a glycerol backbone to form triglycerides (also called fats or oils). Fatty acids are either described as saturated or unsaturated, with saturated fatty acids being solid at room temperature and unsaturated fatty acids being liquid at room temperature. Unsaturated fatty acids are further subdivided into mono-unsaturated (one double bond in the carbon chain) or poly-unsaturated (more than one double bond in the carbon chain). The unique fatty acid profile of each product/crop is a combination of saturated, mono-unsaturated and poly-unsaturated oils and is specific to that type of oil.

Fatty acid profiles of every crop, however, are subject to variation. The variation or typical pattern of fatty acids in a specific oil not only influences the stability and physical properties of the oil but also aids in distinguishing one type of oil from another. Variation of fatty acids within the same product depend on climate, latitude, soil type, cultivar, rainfall as well as seasonal variation. These variations should be included when ranges for identification of authenticity are determined.

It is imperative to include ranges wherein fatty acids vary, in order to successfully validate the authenticity of a specific vegetable oil. Building of a database requires gathering of information over different seasons, areas and cultivars in order to give a true reflection of the ranges wherein fatty acids can differ. Currently, no national updated database for fatty acid composition of sunflower oil is available.

It is important that South Africa, as a sunflower seed producing country, develop and maintain a national fatty acid profile database to the benefit of the Oil Seed Industry. Annual analysis of crop and cultivar samples will ensure that the natural variation caused by different cultivars as well as the influence of climate and locality are included in the database values. Seasonal variations will also be addressed. Recording all variation applicable to the crops in the database will enable the annual review of the specified ranges.

Precision Oil Laboratories was subcontracted for the third consecutive year to perform fatty acid profile analyses on 20 composite crop samples representing different production regions as well as 30 cultivar samples from different localities. Please refer to Tables 6, 7 and 8 on pages 32 to 36 for the results.

The following fatty acid were included in the profile analysis:

C14:0	Myristic acid	C18:3n5	n5 Linolenic acid
C16:0	Palmitic acid	C18:3n3	n3 Linolenic acid
C16:1	Palmitoleic acid	C20:0	Arachidic acid
C17:0	Margaric acid	C20:1	Eicosenoic acid
C17:1	Glinkgolic acid	C20:2	Eicosadienoic acid
C18:0	Stearic acid	C21:0	Heneicosanoic acid
C18:1 c	cis Oleic acid	C22:0	Behenic acid
C18:2 c	cis Linoleic acid	C24:0	Lignoceric acid
C18:3n6	n6 Linolenic acid	C24:1	Nervonic acid

References:

Accum, F., 1820. “A Treatise on Adulteration of Food and Culinary Poisons”, Longman, Hurst, Rees, Orme and Row, London.

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Rossell, J.B., Measurement of rancidity. IN: J.C. and Hamilton R.J. (Eds), Rancidity in Foods. Blackie Academic and Professional, Glasgow, pp22-53.

Van Niekerk, P.J., 1990. Determination of the component oils of edible oil blends. University of Pretoria.

The Fatty acid Profile information was supplied by Dr. Mathilda Mostert from Precision Oil Laboratories.

Table 6: Fatty acid profile results of a selection of crop quality samples from the 2020/21 season

Province	Region	g Fatty acids/100 g Fatty Acids																	
		C14:0	C16:0	C16:1	C17:0	C17:1	C18:0	C18:1 c	C18:2 c	C18:3n6	C18:3n5	C18:3n3	C20:0	C20:1	C20.2	C21:0	C22:0	C24:0	C24:1
North West	12	ND	6.06	ND	ND	ND	5.718	18.10	68.0	ND	LOQ	LOQ	0.405	LOQ	ND	ND	0.91	LOQ	ND
	13	ND	5.87	ND	ND	ND	5.211	20.21	66.7	ND	LOQ	LOQ	0.379	LOQ	ND	ND	0.84	LOQ	ND
	13	ND	5.84	ND	ND	ND	4.868	21.26	66.0	ND	LOQ	LOQ	0.351	LOQ	ND	ND	0.82	LOQ	ND
	13	ND	5.70	ND	ND	ND	5.679	20.83	65.7	ND	LOQ	ND	0.393	LOQ	ND	ND	0.86	LOQ	ND
	14	ND	6.21	ND	ND	ND	5.181	19.48	67.0	ND	LOQ	LOQ	0.387	LOQ	ND	ND	0.87	LOQ	ND
	14	ND	6.29	ND	ND	ND	6.076	17.83	67.6	ND	LOQ	LOQ	0.434	LOQ	ND	ND	0.95	LOQ	ND
	17	ND	6.00	ND	ND	ND	5.353	19.38	67.2	ND	LOQ	LOQ	0.385	LOQ	ND	ND	0.86	LOQ	ND
	17	ND	6.18	ND	ND	ND	5.000	20.46	66.2	ND	LOQ	LOQ	0.391	LOQ	ND	ND	0.94	LOQ	ND
	18	ND	5.84	ND	ND	ND	6.147	19.20	66.7	ND	LOQ	LOQ	0.416	LOQ	ND	ND	0.90	LOQ	ND
	19	ND	6.10	ND	ND	ND	5.823	18.23	67.7	ND	LOQ	LOQ	0.416	LOQ	ND	ND	0.91	LOQ	ND
	19	ND	6.16	ND	ND	ND	5.170	18.25	68.4	ND	LOQ	LOQ	0.371	LOQ	ND	ND	0.88	LOQ	ND
	Min	-	*5.70*	-	-	-	*4.868*	*17.83*	*65.7*	-	-	-	*0.351*	-	-	-	*0.82*	-	-
	Max	-	*6.29*	-	-	-	*6.147*	*21.26*	*68.4*	-	-	-	*0.434*	-	-	-	*0.95*	-	-
	N	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*
Free State	21	ND	5.86	ND	ND	ND	4.477	26.79	60.7	ND	LOQ	LOQ	0.375	LOQ	ND	ND	0.87	0.28	ND
	23	ND	5.84	ND	ND	ND	5.813	17.87	68.4	ND	LOQ	LOQ	0.403	LOQ	ND	ND	0.87	LOQ	ND
	24	ND	6.03	ND	ND	ND	6.238	16.44	69.1	ND	LOQ	LOQ	0.428	LOQ	ND	ND	0.95	LOQ	ND
	26	ND	6.53	ND	ND	ND	5.177	16.68	69.4	ND	LOQ	LOQ	0.405	LOQ	ND	ND	1.01	LOQ	ND
	27	ND	5.82	ND	ND	ND	5.061	20.47	66.6	ND	LOQ	ND	0.383	LOQ	ND	ND	0.84	LOQ	ND
	Min	-	*5.82*	-	-	-	*4.477*	*16.44*	*60.7*	-	-	-	*0.375*	-	-	-	*0.84*	-	-
	Max	-	*6.53*	-	-	-	*6.238*	*26.79*	*69.4*	-	-	-	*0.428*	-	-	-	*1.01*	*0.28*	-
	N	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*
Mpumalanga	29	ND	6.08	ND	ND	ND	6.244	18.57	66.9	ND	LOQ	LOQ	0.441	LOQ	ND	ND	0.94	LOQ	ND
	33	ND	6.15	ND	ND	ND	3.875	28.32	59.6	ND	LOQ	LOQ	0.332	LOQ	ND	ND	0.90	LOQ	ND
	Min	-	*6.08*	-	-	-	*3.875*	*18.57*	*59.6*	-	-	-	*0.332*	-	-	-	*0.90*	-	-
	Max	-	*6.15*	-	-	-	*6.244*	*28.32*	*66.9*	-	-	-	*0.441*	-	-	-	*0.94*	-	-
	N	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Limpopo	35	ND	5.63	ND	ND	ND	5.145	31.10	56.1	ND	LOQ	ND	0.364	LOQ	ND	ND	0.78	LOQ	ND
	35	ND	6.00	ND	ND	ND	5.991	19.67	66.1	ND	LOQ	LOQ	0.456	LOQ	ND	ND	0.98	LOQ	ND
	Min	-	*5.63*	-	-	-	*5.145*	*19.67*	*56.1*	-	-	-	*0.364*	-	-	-	*0.78*	-	-
	Max	-	*6.00*	-	-	-	*5.991*	*31.10*	*66.1*	-	-	-	*0.456*	-	-	-	*0.98*	-	-
	N	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
RSA	*Min*	-	*5.63*	-	-	-	*3.875*	*16.44*	*56.1*	-	-	-	*0.332*	-	-	-	*0.78*	-	-
	Max	-	*6.53*	-	-	-	*6.244*	*31.10*	*69.4*	-	-	-	*0.456*	-	-	-	*1.01*	*0.28*	-
	N	*20*	*20*	*20*	*20*	*20*	*20*	*20*	*20*	*20*	*20*	*20*	*20*	*20*	*20*	*20*	*20*	*20*	*20*

Note:
Limit of detection (LOD) = 0.09 g Fatty acid/100 g Fatty acids.
Limit of quantitation (LOQ) = 0.28 g Fatty acid/100 g Fatty acids.
Values below the limit of quantitation cannot be accurately quantified.
ND = Not detected

Table 7: Fatty acid profile results of a selection of cultivar samples from the 2020/21 season

Province	Locality	Region	Cultivar	g Fatty acids/100 g Fatty Acids																
				C14:0	C16:0	C16:1	C17:0	C17:1	C18:0	C18:1 c	C18:2 c	C18:3n6	C18:3n5	C18:3n3	C20:0	C20:1	C20:2	C21:0	C22:0	C24:0	C24:1
North West	Potchefstroom 1	18	AGSUN 5106 CLP	ND	5.15	ND	ND	ND	6.100	25.78	60.7	ND	0.34	ND	0.388	LOQ	ND	ND	0.90	LOQ	ND
			AGSUN 8251	ND	5.21	ND	ND	ND	6.67	25.40	60.4	ND	0.37	ND	0.428	LOQ	ND	ND	0.90	LOQ	ND
			P 65 LL 14	ND	5.55	ND	ND	ND	5.18	22.77	64.3	ND	0.36	ND	0.365	LOQ	ND	ND	0.85	LOQ	ND
			SY 3970 CL	ND	5.89	ND	ND	ND	4.972	21.15	65.5	ND	0.47	LOQ	0.364	LOQ	ND	ND	0.98	LOQ	ND
			Aguara 6	ND	5.22	ND	ND	ND	4.282	24.65	63.7	ND	0.45	ND	0.321	LOQ	ND	ND	0.75	LOQ	ND
			PAN 7180 CLP	ND	5.76	ND	ND	ND	5.344	24.80	61.9	ND	LOQ	ND	0.392	LOQ	ND	ND	0.91	LOQ	ND
		Min		***-***	***5.15***	***-***	***-***	***-***	***4.282***	***21.15***	***60.4***	***-***	***0.34***	***-***	***0.321***	***-***	***-***	***-***	***0.75***	***-***	***-***
		Max		***-***	***5.89***	***-***	***-***	***-***	***6.67***	***25.78***	***65.5***	***-***	***0.47***	***-***	***0.428***	***-***	***-***	***-***	***0.98***	***-***	***-***
		N		***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***
	Potchefstroom 2	18	AGSUN 5106 CLP	ND	6.01	ND	ND	ND	5.175	21.00	65.7	ND	0.43	ND	0.339	LOQ	ND	ND	0.75	LOQ	ND
			AGSUN 8251	ND	5.75	ND	ND	ND	5.805	21.68	64.7	ND	0.36	ND	0.374	LOQ	ND	ND	0.77	LOQ	ND
			P 65 LL 14	ND	6.38	ND	ND	ND	4.718	19.45	67.3	ND	0.39	ND	0.343	LOQ	ND	ND	0.80	LOQ	ND
			SY 3970 CL	ND	6.57	ND	ND	ND	4.020	17.53	69.5	ND	0.54	LOQ	0.326	LOQ	ND	ND	0.89	LOQ	ND
			Aguara 6	ND	5.57	ND	ND	ND	4.043	21.43	66.8	ND	0.46	ND	0.312	LOQ	ND	ND	0.69	LOQ	ND
			PAN 7180 CLP	ND	6.77	ND	ND	ND	4.554	20.24	66.2	ND	0.34	LOQ	0.353	LOQ	ND	ND	0.83	LOQ	ND
		Min		***-***	***5.57***	***-***	***-***	***-***	***4.020***	***17.53***	***64.7***	***-***	***0.34***	***-***	***0.312***	***-***	***-***	***-***	***0.69***	***-***	***-***
		Max		***-***	***6.77***	***-***	***-***	***-***	***5.805***	***21.68***	***69.5***	***-***	***0.54***	***-***	***0.374***	***-***	***-***	***-***	***0.89***	***-***	***-***
		N		***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***
	Potchefstroom 3	18	AGSUN 5106 CLP	ND	6.37	ND	ND	ND	4.957	18.67	67.9	ND	0.41	ND	0.322	LOQ	ND	ND	0.72	LOQ	ND
			AGSUN 8251	ND	6.32	ND	ND	ND	5.135	18.14	68.3	ND	0.43	ND	0.333	LOQ	ND	ND	0.71	LOQ	ND
			P 65 LL 14	ND	6.72	ND	ND	ND	4.545	17.04	69.6	ND	0.37	ND	0.338	LOQ	ND	ND	0.79	LOQ	ND
			SY 3970 CL	ND	6.84	ND	ND	ND	4.452	19.52	66.9	ND	0.37	LOQ	0.368	LOQ	ND	ND	0.93	LOQ	ND
			Aguara 6	ND	5.53	ND	ND	ND	4.195	20.76	67.3	ND	0.49	ND	0.315	LOQ	ND	ND	0.73	LOQ	ND
			PAN 7180 CLP	ND	7.01	ND	ND	ND	4.300	19.29	67.2	ND	0.35	ND	0.341	LOQ	ND	ND	0.83	LOQ	ND
		Min		***-***	***5.53***	***-***	***-***	***-***	***4.195***	***17.04***	***66.9***	***-***	***0.35***	***-***	***0.315***	***-***	***-***	***-***	***0.71***	***-***	***-***
		Max		***-***	***7.01***	***-***	***-***	***-***	***5.135***	***20.76***	***69.6***	***-***	***0.49***	***-***	***0.368***	***-***	***-***	***-***	***0.93***	***-***	***-***
		N		***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***
	Potchefstroom 4	18	AGSUN 5106 CLP	ND	6.21	ND	ND	ND	7.20	15.52	68.9	ND	0.34	ND	0.423	LOQ	ND	ND	0.83	LOQ	ND
			AGSUN 8251	ND	6.03	ND	ND	ND	7.49	14.66	69.6	ND	0.36	ND	0.442	LOQ	ND	ND	0.79	LOQ	ND
			P 65 LL 14	ND	6.79	ND	ND	ND	5.440	14.25	71.3	ND	LOQ	LOQ	0.384	LOQ	ND	ND	0.88	LOQ	ND
			SY 3970 CL	ND	6.50	ND	ND	ND	5.942	13.77	71.3	ND	0.37	LOQ	0.433	LOQ	ND	ND	1.06	LOQ	ND
			Aguara 6	ND	5.52	ND	ND	ND	5.202	16.51	70.6	ND	0.35	LOQ	0.359	LOQ	ND	ND	0.80	LOQ	ND
			PAN 7180 CLP	ND	6.88	ND	ND	ND	5.974	16.60	68.2	ND	0.29	LOQ	0.425	LOQ	ND	ND	0.94	LOQ	ND
		Min		***-***	***5.52***	***-***	***-***	***-***	***5.202***	***13.77***	***68.2***	***-***	***0.29***	***-***	***0.359***	***-***	***-***	***-***	***0.79***	***-***	***-***
		Max		***-***	***6.88***	***-***	***-***	***-***	***7.49***	***16.60***	***71.3***	***-***	***0.37***	***-***	***0.442***	***-***	***-***	***-***	***1.06***	***-***	***-***
		N		***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***	***6***

Table 7: Fatty acid profile results of a selection of cultivar samples from the 2020/21 season (continue)																				
Province	Locality	Region	Cultivar	g Fatty acids/100 g Fatty Acids																
				C14:0	C16:0	C16:1	C17:0	C17:1	C18:0	C18:1 c	C18:2 c	C18:3n6	C18:3n5	C18:3n3	C20:0	C20:1	C20:2	C21:0	C22:0	C24:0	C24:1
North West	Potchefstroom 5	18	AGSUN 5106 CLP	ND	5.78	ND	ND	ND	9.13	14.66	68.2	ND	LOQ	LOQ	0.529	LOQ	ND	ND	0.90	LOQ	ND
			AGSUN 8251	ND	5.80	ND	ND	ND	9.10	13.78	69.1	ND	LOQ	LOQ	0.529	LOQ	ND	ND	0.87	LOQ	ND
			P 65 LL 14	ND	6.17	ND	ND	ND	7.70	13.92	69.9	ND	LOQ	ND	0.491	LOQ	ND	ND	0.96	LOQ	ND
			SY 3970 CL	ND	5.88	ND	ND	ND	8.37	13.86	69.5	ND	0.30	LOQ	0.527	LOQ	ND	ND	1.03	LOQ	ND
			Aguara 6	ND	5.23	ND	ND	ND	6.82	15.55	70.2	ND	0.30	LOQ	0.429	LOQ	ND	ND	0.86	LOQ	ND
			PAN 7180 CLP	ND	6.26	ND	ND	ND	7.48	15.09	68.9	ND	LOQ	LOQ	0.490	LOQ	ND	ND	0.94	LOQ	ND
		Min		*-*	*5.23*	*-*	*-*	*-*	*6.82*	*13.78*	*68.2*	*-*	*0.30*	*-*	*0.429*	*-*	*-*	*-*	*0.86*	*-*	*-*
		Max		*-*	*6.26*	*-*	*-*	*-*	*9.13*	*15.55*	*70.2*	*-*	*0.30*	*-*	*0.529*	*-*	*-*	*-*	*1.03*	*-*	*-*
		N		*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
	Min			*-*	*5.15*	*-*	*-*	*-*	*4.020*	*13.77*	*60.4*	*-*	*0.29*	*-*	*0.312*	*-*	*-*	*-*	*0.69*	*-*	*-*
	Max			*-*	*7.01*	*-*	*-*	*-*	*9.13*	*25.78*	*71.3*	*-*	*0.54*	*-*	*0.529*	*-*	*-*	*-*	*1.06*	*-*	*-*
	N			*30*	*30*	*30*	*30*	*30*	*30*	*30*	*30*	*30*	*30*	*30*	*30*	*30*	*30*	*30*	*30*	*30*	*30*

Note:
Limit of detection (LOD) = 0.09 g Fatty acid/100 g Fatty acids.
Limit of quantitation (LOQ) = 0.28 g Fatty acid/100 g Fatty acids.
Values below the limit of quantitation cannot be accurately quantified.
ND = Not detected

Table 8: Fatty acid profile results per cultivar - 2020/21 season

Province	Region	Cultivar	g Fatty acids/100 g Fatty Acids																
			C14:0	C16:0	C16:1	C17:0	C17:1	C18:0	C18:1 c	C18:2 c	C18:3n6	C18:3n5	C18:3n3	C20:0	C20:1	C20:2	C21:0	C22:0	C24:0	C24:1
North West	18	AGSUN 5106 CLP	ND	5.15	ND	ND	ND	6.100	25.78	60.7	ND	0.34	ND	0.388	LOQ	ND	ND	0.90	LOQ	ND
			ND	6.01	ND	ND	ND	5.175	21.00	65.7	ND	0.43	ND	0.339	LOQ	ND	ND	0.75	LOQ	ND
			ND	6.37	ND	ND	ND	4.957	18.67	67.9	ND	0.41	ND	0.322	LOQ	ND	ND	0.72	LOQ	ND
			ND	6.21	ND	ND	ND	7.20	15.52	68.9	ND	0.34	ND	0.423	LOQ	ND	ND	0.83	LOQ	ND
			ND	5.78	ND	ND	ND	9.13	14.66	68.2	ND	LOQ	LOQ	0.529	LOQ	ND	ND	0.90	LOQ	ND
Min			-	*5.15*	-	-	-	*4.957*	*14.66*	*60.7*	-	*0.34*	-	*0.322*	-	-	-	*0.72*	-	-
Max			-	*6.37*	-	-	-	*9.13*	*25.78*	*68.9*	-	*0.43*	-	*0.529*	-	-	-	*0.90*	-	-
N			*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*
North West	18	AGSUN 8251	ND	5.21	ND	ND	ND	6.67	25.40	60.4	ND	0.37	ND	0.428	LOQ	ND	ND	0.90	LOQ	ND
			ND	5.75	ND	ND	ND	5.805	21.68	64.7	ND	0.36	ND	0.374	LOQ	ND	ND	0.77	LOQ	ND
			ND	6.32	ND	ND	ND	5.135	18.14	68.3	ND	0.43	ND	0.333	LOQ	ND	ND	0.71	LOQ	ND
			ND	6.03	ND	ND	ND	7.49	14.66	69.6	ND	0.36	ND	0.442	LOQ	ND	ND	0.79	LOQ	ND
			ND	5.80	ND	ND	ND	9.10	13.78	69.1	ND	LOQ	LOQ	0.529	LOQ	ND	ND	0.87	LOQ	ND
Min			-	*5.21*	-	-	-	*5.135*	*13.78*	*60.4*	-	*0.36*	-	*0.333*	-	-	-	*0.71*	-	-
Max			-	*6.32*	-	-	-	*9.10*	*25.40*	*69.6*	-	*0.43*	-	*0.529*	-	-	-	*0.90*	-	-
N			*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*
North West	18	Aguara 6	ND	5.22	ND	ND	ND	4.282	24.65	63.7	ND	0.45	ND	0.321	LOQ	ND	ND	0.75	LOQ	ND
			ND	5.57	ND	ND	ND	4.043	21.43	66.8	ND	0.46	ND	0.312	LOQ	ND	ND	0.69	LOQ	ND
			ND	5.53	ND	ND	ND	4.195	20.76	67.3	ND	0.49	ND	0.315	LOQ	ND	ND	0.73	LOQ	ND
			ND	5.52	ND	ND	ND	5.202	16.51	70.6	ND	0.35	LOQ	0.359	LOQ	ND	ND	0.80	LOQ	ND
			ND	5.23	ND	ND	ND	6.82	15.55	70.2	ND	0.30	LOQ	0.429	LOQ	ND	ND	0.86	LOQ	ND
Min			-	*5.22*	-	-	-	*4.043*	*15.55*	*63.7*	-	*0.30*	-	*0.312*	-	-	-	*0.69*	-	-
Max			-	*5.57*	-	-	-	*6.82*	*24.65*	*70.6*	-	*0.49*	-	*0.429*	-	-	-	*0.86*	-	-
N			*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*
North West	18	P 65 LL 14	ND	5.55	ND	ND	ND	5.18	22.77	64.3	ND	0.36	ND	0.365	LOQ	ND	ND	0.85	LOQ	ND
			ND	6.38	ND	ND	ND	4.718	19.45	67.3	ND	0.39	ND	0.343	LOQ	ND	ND	0.80	LOQ	ND
			ND	6.72	ND	ND	ND	4.545	17.04	69.6	ND	0.37	ND	0.338	LOQ	ND	ND	0.79	LOQ	ND
			ND	6.79	ND	ND	ND	5.440	14.25	71.3	ND	LOQ	LOQ	0.384	LOQ	ND	ND	0.88	LOQ	ND
			ND	6.17	ND	ND	ND	7.70	13.92	69.9	ND	LOQ	ND	0.491	LOQ	ND	ND	0.96	LOQ	ND
Min			-	*5.55*	-	-	-	*4.545*	*13.92*	*64.3*	-	*0.36*	-	*0.338*	-	-	-	*0.79*	-	-
Max			-	*6.79*	-	-	-	*7.70*	*22.77*	*71.3*	-	*0.39*	-	*0.491*	-	-	-	*0.96*	-	-
N			*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*

Table 8: Fatty acid profile results per cultivar - 2020/21 season

Province	Region	Cultivar	g Fatty acids/100 g Fatty Acids																
			C14:0	C16:0	C16:1	C17:0	C17:1	C18:0	C18:1 c	C18:2 c	C18:3n6	C18:3n5	C18:3n3	C20:0	C20:1	C20:2	C21:0	C22:0	C24:0	C24:1
North West	18	PAN 7180 CLP	ND	5.76	ND	ND	ND	5.344	24.80	61.9	ND	LOQ	ND	0.392	LOQ	ND	ND	0.91	LOQ	ND
			ND	6.77	ND	ND	ND	4.554	20.24	66.2	ND	0.34	LOQ	0.353	LOQ	ND	ND	0.83	LOQ	ND
			ND	7.01	ND	ND	ND	4.300	19.29	67.2	ND	0.35	ND	0.341	LOQ	ND	ND	0.83	LOQ	ND
			ND	6.88	ND	ND	ND	5.974	16.60	68.2	ND	0.29	LOQ	0.425	LOQ	ND	ND	0.94	LOQ	ND
			ND	6.26	ND	ND	ND	7.48	15.09	68.9	ND	LOQ	LOQ	0.490	LOQ	ND	ND	0.94	LOQ	ND
Min			***-***	***5.76***	***-***	***-***	***-***	***4.300***	***15.09***	***61.9***	***-***	***0.29***	***-***	***0.341***	***-***	***-***	***-***	***0.83***	***-***	***-***
Max			***-***	***7.01***	***-***	***-***	***-***	***7.48***	***24.80***	***68.9***	***-***	***0.35***	***-***	***0.490***	***-***	***-***	***-***	***0.94***	***-***	***-***
N			***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***
North West	18	SY 3970 CL	ND	5.89	ND	ND	ND	4.972	21.15	65.5	ND	0.47	LOQ	0.364	LOQ	ND	ND	0.98	LOQ	ND
			ND	6.57	ND	ND	ND	4.020	17.53	69.5	ND	0.54	LOQ	0.326	LOQ	ND	ND	0.89	LOQ	ND
			ND	6.84	ND	ND	ND	4.452	19.52	66.9	ND	0.37	LOQ	0.368	LOQ	ND	ND	0.93	LOQ	ND
			ND	6.50	ND	ND	ND	5.942	13.77	71.3	ND	0.37	LOQ	0.433	LOQ	ND	ND	1.06	LOQ	ND
			ND	5.88	ND	ND	ND	8.37	13.86	69.5	ND	0.30	LOQ	0.527	LOQ	ND	ND	1.03	LOQ	ND
Min			***-***	***5.88***	***-***	***-***	***-***	***4.020***	***13.77***	***65.5***	***-***	***0.30***	***-***	***0.326***	***-***	***-***	***-***	***0.89***	***-***	***-***
Max			***-***	***6.84***	***-***	***-***	***-***	***8.37***	***21.15***	***71.3***	***-***	***0.54***	***-***	***0.527***	***-***	***-***	***-***	***1.06***	***-***	***-***
N			***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***
All Min			***-***	***5.15***	***-***	***-***	***-***	***4.020***	***13.77***	***60.4***	***-***	***0.29***	***-***	***0.312***	***-***	***-***	***-***	***0.69***	***-***	***-***
All Max			***-***	***7.01***	***-***	***-***	***-***	***9.13***	***25.78***	***71.3***	***-***	***0.54***	***-***	***0.529***	***-***	***-***	***-***	***1.06***	***-***	***-***
All N			***30***	***30***	***30***	***30***	***30***	***30***	***30***	***30***	***30***	***30***	***30***	***30***	***30***	***30***	***30***	***30***	***30***	***30***

Note:
Limit of detection (LOD) = 0.09 g Fatty acid/100 g Fatty acids.
Limit of quantitation (LOQ) = 0.28 g Fatty acid/100 g Fatty acids.
Values below the limit of quantitation cannot be accurately quantified.
ND = Not detected

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 67 to 74 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 7971-3:2019, 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

Crude fibre is the loss on ignition of the dried residue remaining after digestion of a sample with 1.25% Sulphuric acid (H_2SO_4) and 1.25% Sodium hydroxide (NaOH) solutions under specific conditions.

In-House method 031 was used for the determination of the crude fibre in the samples. This method is based on AACCI method 32-10.01 using the Velp FIWE Advance fibre AutoExtractor.

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.

PRECISION OIL LABORATORIES' FATTY ACID PROFILE METHODS:

Fat Extraction

In-House method POL 019 was used for the extraction of the crude fat from the samples. After sample preparation the fat is extracted by petroleum ether under reflux, followed by the removal of the solvent by evaporation. The residue obtained from the fat extraction is used for preparation of methyl esters for determination of the fatty acid profile

Fatty Acid Profile

In-House method POL 015 was used for determination of the fatty acid composition. Extracted fat is converted to methyl esters using an alkali catalyzed method. Methyl esters are injected into a Gas Chromatograph and an external fatty acid methyl ester standard is used to identify peaks based on retention times. The fatty acid composition is expressed as a total fatty acid content of 100% with different fatty acids representing a percentage of the total fatty acids.

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 facility provided that all 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 17025:2017

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

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

Mr R Josias
Chief Executive Officer

Effective Date: 01 November 2019
Certificate Expires: 31 October 2024

ANNEXURE A

SCHEDULE OF ACCREDITATION

Facility Number: **T0116**

Permanent Address of Laboratory:

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Ms M Bothma (All Chemical Methods)
Ms A de Jager (Nutrients & Contaminants Methods)
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Ms D Moleke (Rheological Methods)
Mrs H Meyer (All Chemical, Nutrients and Contaminants & Grading Methods)
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Issue No.: 32
Date of Issue: 19 November 2021
Expiry Date: 31 October 2024

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 are sugar coated)	Moisture (Oven Method)	AACCI 44-15.02, Latest Edition (1 hour; 130˚C) (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

Report

Evaluation of sunflower cultivars: 2020/2021 season

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

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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 2020/2021 season with the voluntary collaboration of Agricol, Cortiva (Pannar,Pioneer), Syngenta, Sensako and Limagrain. Seed companies entered 21 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 except LG 5710 (Table 1). Seed from cultivars were packed according to trial plans and send to co-operators before the onset of the growing season.

Twelve of the 21 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®.

Each collaborating seed company had to conduct at least one trial for each cultivar entry. Agricol was supplied with seed for 10 trials, Cortiva (Pannar & Pioneer) with 10 trials, Syngenta/Sensako with one and Limagrain with three. 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.

Four trials of Cortiva not planted or not harvested due to bad trial quality. Six trials were not statistically successful and were not included in the results. 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 three trials at Boskop with different planting dates. One trial at Klipdriftdam, Bothaville, Lichtenburg, Wolmaransstad and Ventersdorp.

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 19 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 19 trials.

Yield probabilities were also calculated for 17 cultivars that were evaluated in 40 trials during 2019/2020 and 2021/2022.

RESULTS

Days from planting to flowering

The mean number of days from planting to 50% flowering of cultivars (Table 4) ranged from 67 days for LG 5710, P 65 LL14, AGSUN 5108 CLP and PAN 7102 CLP, to 71 days AGSUN 5106 CLP. Calculated across cultivars and planting dates, the average period from planting to flowering was 69 days. The longest days to flowering recorded at Potchefstroom planted on the 21 of January 2021.

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 oil content on “as is“ basis for cultivars at the various localities varied from 38.51 to 44.30% with an overall mean of 41.02%.

The highest mean oil concentration among localities was at Potchefstroom (planting date 30 November 2020) with 44.30%. The locality with the lowest mean oil content of 38.51% was Bothaville planting date was January 26, 2021. The highest oil concentration among cultivars and calculated across localities, was LG 710 at 47.54% followed by SY 3970 CL at 47.49%

The average protein content varied from 14.90 to 17.88% among cultivars at the different localities. Among localities, Boskop planted in October 11, 2020 had the highest and Potchefstroom planted in December 10, 2020 the lowest protein content of 20.06 and 11.38% respectively. Calculated across localities, LG 5678 CLP had the highest protein content (17.88 %) followed by AGSUN 5102 CLP (16.93) while GUARA6 the lowest (14.90%).

Seed yield

The mean seed yield of cultivars at the respective localities is presented in Table 7. The highest locality mean yield of 3.40 t ha^{-1} was obtained at Bothaville planted on 26 of January 2021 and the lowest of 0.80 t ha^{-1}, at Petrusburg planted on 22 of January 2021. The five best performing cultivars, in terms of average yield calculated over localities, were AGSUN 5103 CLP, AGSUN 5270, AGSUN 8251, PAN 7180 CLP & PAN 7160 CLP. The overall mean yield for 2019/20 was 2.38 t ha^{-1}, 5 % lower than the mean yield of the last year.

Twelve Clearfield and Clearfield Plus cultivars, AGSUN 5101 CLP, AGSUN 5102 CLP, AGSUN 5103 CLP, AGSUN 5106 CLP, AGSUN 5108 CLP, LG 5678 CLP, P 65 LP 54, P 65 LP 65, PAN 7102 CLP, PAN 7160 CLP, PAN 7180 CLP, and SY 3970 CL were entered. Eight of these cultivars namely AGSUN 5103 CLP, PAN 7180 CLP, PAN 7160 CLP, AGSUN 5106 CLP, P 65 LP 54 , PAN 7102 CLP, AGSUN 5102 CLP and P 65 LP 65 have yields even or 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 0.95 to 1.29 t ha^{-1} with an overall mean of 1.08 t ha^{-1}. The locality with the highest mean oil yield was Botha ville planted in January 26, 2021 at 1.32 t ha^{-1}. LG 5710 has the highest oil yield of 1.29 t ha^{-1} followed by AGSUN 5270 with 1.22 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 (R^2- 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 2020/2021 are shown in Figure 1 and for the 17 cultivars evaluated in 2019/2020 and 2020/2021 in Figure 2.

The yield stability of cultivars varied up to 21 fold among cultivars (Table 10). Cultivars which had exceptionally high stabilities (R-parameter =1) were, AGSUN5 108 CLP, AGSUN 5102 CLP, LG 5678 CLP and AGSUN 5101 CLP

Yield probability

The yield probability of a cultivar, is the probability of exceeding the mean yield of all cultivars, at a particular yield potential. The yield probabilities of all 21 cultivars for 2020/2021 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 17 cultivars evaluated in 40 trials in 2019/2020 and 2020/21, and yield probabilities for the 16 cultivars evaluated in 54 trials are shown in Tables 12 and 13 respectively. Tables 11, 12 and 13 should be used jointly for cultivar selection.

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References

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Table 1: Cultivars evaluated and seed germination rate and supplier company 2020/21

Cultivar's Name	Germinated (%)			
	Normal	Abnormal	Dormant/dead	Company
AGSUN 5101 CLP	98	1	1	Agricol
AGSUN 5102 CLP	97	2	1	Agricol
AGSUN 5103 CLP	98	1	1	Agricol
AGSUN 5106 CLP	98	1	1	Agricol
AGSUN 5108 CLP	99	1	0	Agricol
AGSUN 5270	98	2	0	Agricol
AGSUN 8251	95	3	2	Agricol
Aguara 6	95	4	1	Lima Grain
LG 5678 CLP	91	5	4	Lima Grain
LG 5710	72	13	15	Lima Grain
P 65 LL 02	93	4	3	Pioneer
P 65 LL 14	96	1	3	Pioneer
P 65 LP 54	95	3	2	Pioneer
P 65 LP 65	98	1	1	Pioneer
PAN 7080	93	4	3	Pannar
PAN 7100	87	7	6	Pannar
PAN 7102 CLP	97	2	1	Pannar
PAN 7160 CLP	92	5	3	Pannar
PAN 7170	95	3	2	Pannar
PAN7180 CLP	96	2	2	Pannar
SY 3970 CL	95	2	3	Sensako

Table 2: Collaborating company, trial localities and responsible co-workers 2020/2021

Company	Localities	Planting dates	Co-workers	E-mail address of co-worker
Agricol	Boskop 1	11/10/2020	Joubert Swanepoel	Jouberts@agricol.co.za
	Boskop 2	30/11/2020		
	Boskop 3	14/01/2021		
	Fochville	Not planted		
	Klipdriftdam	22/12/2020		
	Bothaville	26/01/2021		
	Lichtenburg	25/11/2020		
	Wolmaranstad	08/01/2021		
	Ventersdorp 2	19/01/2021		
	Ventersdorp 1	12/10/2020		
	Sannieshof	18/01/2021		
ARC-GCI	Potchefstroom	23/11/2020	William Makgoga & Jan Erasmus	Makgogamw@arc.agric.za Erasmusj@arc.agric.za
		30/11/2020		
		10/12/2020		
		04/01/2021		
		21/01/2021		
Corteva	Putfontein	24/11/2020	Abre Pretorius & Louis Schoonraad Phillip Fourie	abre.pretorius@pannar.co.za louis.schoonraad@corteva.com philip.fourie@pioneer.com
	Coligny	30/11/2020		
	Coligny	01/12/2020		
	Gerdau	02/12/2020		
	Gerdau	02/12/2020		
	Lusthoff	03/12/2020		
	Lusthoff	03/12/2020		
	Petrusburg	21/01/2021		
	Kroonstad	29/12/2020		
	Senekal	03/12/2020		
	Hennenman	15/12/2020		
	Bethlehem	26/11/2020		
	Kroonstad	02/12/2020		
	Senekal	03/12/2020		
	Kroonstad	02/12/2020		
Lima grain	Potchefstroom	04/12/2020	Anita Janeke	anita.janeke@limagrain.com
	Fauresmith	23/01/2021		
	Petrusburg	22/01/2021		
Syngenta	Kroonstad	28/12/2020	PieterTaljaard	Pieter.Taljaard@syngenta.com

Table 3:Trial successful site information 2020/2021season

			Top soil analysis (mg /kg)									
Locality	Planting date	Plant /ha	soil texture	pH (KCl)	P	K	Ca	Mg	Fertiliser applied	Raw width (m)	Weed control	Net Plot (m2)
Boskop 1	11/10/2020	40000								0,91	Alanex and Karate	11,83
Boskop 2	30/11/2020	40000								0,91	Alanex and Karate	11,83
Boskop 3	14/01/2021	40000								0,91	Alanex and Karate	11,83
Bothaville	26/01/2021	40000								0,91	Mechanical weeding	11,83
Klipdriftdam	22/12/2020	40000								0,91	Mechanical weeding	11,83
Lichtenburg	25/11/2020	40000								0,91	Mechanical weeding	11,83
Wolmaranstad	08/01/2021	40000								0,91	Mechanical weeding	11,83
Ventersdorp	12/10/2020	40000								0,91	Mechanical weeding	11,83
Sannieshof	18/01/2021	40000								0,91	Mechanical weeding	11,83
Potchefstroom	23/11/2020	40000	Sandy Clay	5,85	21	183	868	403	3:2:1(32) @100 kg/ha UAN (28) @ 146 Kg/ha	0,90	Frontier Optima, Mechanical	12,6
Potchefstroom	30/11/2020	40000	Sandy Clay	6,05	31	380	860	420	3:2:1(32) @100 kg/ha UAN (28) @ 171 Kg/ha	0,90	Frontier Optima, Mechanical	12,6
Potchefstroom	10/12/2020	40000	Sandy Clay	6,05	31	380	860	420	3:2:1(32) @100 kg/ha UAN (28) @ 171 Kg/ha	0,90	Frontier Optima, Mechanical	12,6
Potchefstroom	04/01/2021	40000	Sandy Clay	6,05	31	380	860	420	3:2:1(32) @100 kg/ha UAN (28) @ 171 Kg/ha	0,90	Frontier Optima, Mechanical	12,6
Potchefstroom	21/01/2021	40000	Sandy Clay	6,06	65	390	733	418	3:2:1(32) @100 kg/ha UAN (28) @ 160 Kg/ha	0,90	Frontier Optima, Mechanical	12,6
Coligny	30/11/2020								4:2:1(34) x 200kg	0,91		32,76
Gerdau	02/12/2020									0,91		32,76
Kroonstad	02/12/2020									0,91		14,56
Fauresm	23/01/2021	35-40000	Red Sand						7:2:1(29)ZnS @130 kg/ha	1,2	None	14,4
Petrusburg	22/01/2021	35-40000	Red Sand						6:2:1(36) 96kg/ha	1,2	None	28,8

Table 4: Number of days from planting to 50 percent flowering of cultivars at selected localities and planting dates 2020/2021

Cultivar	Boskop 11/10/2020	Boskop 30/11/2020	Boskop 14/01/2021	Bothaville 26/01/2021	Klipdriftdam 22/12/2020	Lichtenburg 25/11/2020	Wolmaransstad 08/01/2021	Ventersdorp 12/10/2020	Potchefstroom 23/11/2020	Potchefstroom 30/11/2020	Potchefstroom 01/12/2020	Potchefstroom 04/01/2021	Potchefstroom 20/01/2021	Mean
AGSUN5101CLP	67	68	67	75	69	66	66	67	68	68	68	71	79	69
AGSUN5102CLP	69	65	67	73	68	66	67	68	68	70	67	78	78	70
AGSUN5103CLP	70	70	68	75	69	67	67	69	64	71	67	78	79	70
AGSUN5106CLP	69	69	69	76	72	69	67	69	66	71	68	79	80	71
AGSUN5108CLP	65	67	65	69	68	68	66	65	66	66	66	70	75	67
AGSUN5270	64	61	68	68	72	66	69	64	60	70	66	78	74	68
AGSUN8251	68	65	67	73	69	67	67	67	66	67	66	70	78	68
Aguara6	68	68	67	72	73	69	67	67	66	70	66	73	75	69
LG5678CLP	66	67	66	75	69	68	61	61	67	70	67	73	78	68
LG5710	67	63	66	72	67	68	66	66	61	66	65	69	75	67
P65LL02	70	68	68	75	74	66	66	66	64	72	68	73	78	70
P65LL14	69	64	60	73	67	68	61	67	62	67	65	74	77	67
P65LP54	65	62	64	75	69	65	68	65	60	68	67	78	78	68
P65LP65	64	65	67	75	73	66	67	67	67	72	68	82	81	70
PAN7080	66	67	64	71	69	68	66	62	66	73	68	81	78	69
PAN7100	66	66	67	72	68	67	69	67	62	68	67	82	74	69
PAN7102CLP	64	61	69	73	67	65	66	69	60	66	65	73	79	67
PAN7160CLP	68	63	67	73	68	67	66	67	66	69	66	81	81	69
PAN7170	66	62	68	71	69	64	67	67	64	70	66	78	77	68
PAN7180CLP	68	67	69	70	72	66	66	66	66	71	66	82	82	70
SY3970CL	71	69	68	70	73	67	66	65	66	71	69	79	78	70
Mean	67	66	67	73	70	67	66	66	65	69	67	76	78	69

Table 5: The moisture free seed oil concentration (%) of cultivars at selected localities 2020/2021

Cultivar	Boskop 11/10/2020	Boskop 14/01/2021	Bothaville 26/01/2021	Lichtenburg 25/11/2020	Potchefstroom 30/11/2020	Potchefstroom 10/12/2020	Potchefstroom 21/01/2021	Mean
AGSUN5101CLP	32,92	38,52	35,40	37,53	39,18	40,36	36,78	37,24
AGSUN5102CLP	33,15	37,44	36,25	38,04	40,34	41,49	36,27	37,57
AGSUN5103CLP	35,85	38,88	35,21	36,70	39,87	42,19	35,29	37,71
AGSUN5106CLP	30,73	38,49	32,49	36,70	41,15	43,32	36,02	36,99
AGSUN5108CLP	31,14	38,56	34,74	38,58	40,87	40,31	35,36	37,08
AGSUN5270	33,37	42,94	38,67	42,75	45,74	48,01	41,51	41,85
AGSUN8251	33,99	39,95	37,08	35,66	39,50	43,33	36,78	38,04
AGUARA6	38,07	43,46	43,22	44,94	47,37	47,80	43,42	44,04
LG5678CLP	39,29	44,32	41,60	43,27	47,71	47,57	41,91	43,67
LG5710	40,72	46,84	45,32	44,98	49,25	51,78	47,80	46,67
P65LL02	38,23	40,76	42,09	38,96	44,26	45,98	42,18	41,78
P65LL14	38,56	41,42	38,96	37,16	43,46	45,02	40,45	40,72
P65LP54	32,96	37,92	34,56	33,98	37,44	36,69	37,42	35,85
P65LP65	36,04	41,08	39,69	38,73	42,42	44,79	41,76	40,64
PAN7080	36,77	36,36	37,40	40,78	42,66	43,58	38,10	39,38
PAN7100	35,08	39,87	38,04	41,83	44,70	45,16	40,76	40,78
PAN7102CLP	35,76	38,86	38,46	36,99	39,10	38,61	37,18	37,85
PAN7160CLP	35,15	41,79	37,61	42,09	42,94	42,47	40,34	40,34
PAN7170	39,61	39,44	40,02	42,42	45,74	46,71	42,19	42,30
PAN7180CLP	33,09	37,22	38,30	39,30	39,96	42,31	37,89	38,30
SY3970CL	42,99	44,65	43,61	48,28	51,72	52,73	46,80	47,25
Mean	35,88	40,42	38,51	39,98	43,11	44,30	39,82	40,29

Table 6: The moisture free seed protein concentration (%) of cultivars at selected localities 2020/2021

Cultivar	Boskop 11/10/2020	Boskop 14/01/2021	Bothaville 26/01/2021	Lichtenburg 25/11/2020	Potchefstroom 30/11/2020	Potchefstroom 10/12/2020	Potchefstroom 20/01/2021	Mean
AGSUN5101CLP	20,66	18,97	20,27	13,32	12,05	12,49	18,27	16,58
AGSUN5102CLP	20,77	19,90	21,91	13,87	12,11	12,15	17,78	16,93
AGSUN5103CLP	20,14	18,57	20,52	13,36	11,45	11,91	17,17	16,16
AGSUN5106CLP	21,34	18,41	21,08	14,10	11,10	11,38	17,15	16,37
AGSUN5108CLP	20,85	19,11	21,01	14,50	12,70	11,89	17,18	16,75
AGSUN5270	21,08	18,64	19,23	12,41	11,68	10,94	16,83	15,83
AGSUN8251	18,96	17,92	19,51	13,09	12,03	10,86	15,05	15,35
AGUARA6	18,48	18,23	18,64	10,87	10,36	11,44	16,30	14,90
LG5678CLP	21,72	20,23	20,98	14,23	14,49	14,27	19,26	17,88
LG5710	20,77	16,59	20,16	12,19	12,84	11,42	15,79	15,68
P65LL02	19,46	20,51	19,25	12,54	11,54	11,80	15,85	15,85
P65LL14	20,68	19,23	19,71	12,99	11,61	10,56	14,96	15,68
P65LP54	20,68	19,45	19,76	12,94	12,46	10,83	15,08	15,89
P65LP65	20,38	19,47	17,55	12,61	11,63	12,21	14,16	15,43
PAN7080	17,96	19,80	18,52	12,63	10,54	10,52	15,26	15,04
PAN7100	18,78	18,98	18,27	13,41	11,38	10,52	16,04	15,34
PAN7102CLP	19,81	18,83	18,89	14,41	11,84	10,28	13,32	15,34
PAN7160CLP	20,38	18,47	18,48	14,92	11,60	10,26	13,87	15,43
PAN7170	19,80	19,89	20,53	14,78	11,05	10,26	14,82	15,88
PAN7180CLP	20,51	19,72	19,32	15,58	11,37	11,12	14,83	16,06
SY3970CL	18,09	19,98	20,65	15,01	11,56	11,81	17,04	16,31
Mean	20,06	19,09	19,73	13,51	11,78	11,38	16,00	15,94

Table 7: Mean seed yield (t ha^{-1}) of cultivars at each locality 2020/2021

Cultivar	Boskop 11/10/20	Boskop 30/11/20	Boskop 14/01/21	Bothaville 26/01/21	Coligny 30/11/20	Fauresmith 23/01/21	Gerdau 2/12/20	Klipdriftdam 22/12/20	Kroonstad 2/12/20	Lichtenburg 25/11/20	Petrusburg 22/01/21	Potchefstroom 23/11/20	Potchefstroom 30/11/20	Potchefstroom 10/12/20	Potchefstroom 4/01/21	Potchefstroom 21/01/21	Sannieshof 18/01/21	Ventersdorp 12/10/20	Wolmaransstad 8/01/21	Mean
AGSUN5101CLP	3,05	3,34	3,11	3,41	2,27	1,69	2,49	1,94	2,27	2,79	0,70	2,77	2,21	2,07	1,88	1,91	1,72	2,87	1,80	2,33
AGSUN5102CLP	3,08	3,14	3,04	3,40	2,77	1,83	2,69	1,98	2,36	2,60	0,74	2,76	2,37	2,15	1,97	1,78	1,98	2,47	2,07	2,38
AGSUN5103CLP	3,56	3,95	3,23	3,97	2,39	1,57	2,52	2,41	2,48	2,47	0,80	2,67	2,49	2,02	2,02	2,07	1,92	2,76	2,37	2,51
AGSUN5106CLP	2,73	3,75	3,09	3,59	2,94	1,88	2,40	2,34	1,72	3,13	0,94	2,87	2,59	2,02	2,04	1,78	1,77	2,56	2,14	2,44
AGSUN5108CLP	2,67	2,94	2,92	3,32	2,83	1,54	2,33	2,22	2,03	2,95	0,68	2,86	2,39	2,20	2,14	1,89	1,83	2,44	1,96	2,32
AGSUN5270	2,65	3,58	3,52	3,61	2,39	2,02	2,39	2,65	1,88	3,03	0,79	2,73	2,58	2,37	2,28	2,14	2,14	2,78	1,89	2,50
AGSUN8251	2,86	3,45	2,95	3,50	2,57	1,86	2,53	2,72	2,10	2,50	0,75	2,91	2,50	2,23	2,24	2,09	1,97	2,73	2,90	2,49
AGUARA6	2,71	2,94	2,92	3,31	3,04	1,96	2,84	1,62	2,33	2,61	0,84	2,83	2,41	2,07	2,25	2,10	1,44	2,15	1,84	2,33
LG5678CLP	2,39	3,04	2,68	2,92	2,41	1,68	2,34	2,02	1,91	2,50	0,75	2,21	2,20	2,04	2,21	1,83	1,48	2,48	1,58	2,14
LG5710	3,07	2,89	2,92	3,35	2,58	1,42	2,68	1,77	2,23	2,41	0,66	2,96	2,76	2,43	2,18	2,03	1,77	2,61	1,51	2,33
P65LL02	3,02	2,79	3,39	3,79	2,80	1,62	2,71	2,03	2,21	2,03	0,90	3,10	2,35	2,47	2,24	2,16	1,77	2,04	1,69	2,37
P65LL14	2,38	3,31	3,10	3,17	2,38	1,70	1,93	2,03	2,34	2,58	0,91	2,95	2,28	2,25	2,14	1,82	1,92	2,65	1,84	2,30
P65LP54	2,11	3,75	3,13	3,53	2,14	2,13	2,54	2,36	2,06	2,35	0,86	2,82	2,55	2,37	2,26	2,10	1,77	2,88	2,41	2,43
P65LP65	2,25	3,53	3,16	3,56	2,46	1,98	1,92	2,27	2,36	2,59	0,71	2,83	2,54	2,08	2,11	2,00	1,78	2,37	2,61	2,37
PAN7080	2,62	3,23	3,56	3,83	2,86	2,03	1,98	2,25	2,10	2,87	0,80	3,28	2,54	2,18	1,87	2,14	1,72	2,43	1,97	2,43
PAN7100	2,82	3,28	3,14	3,47	2,43	2,06	1,86	1,93	2,34	3,17	0,92	2,90	2,98	2,30	2,11	2,03	2,16	2,39	2,09	2,44
PAN7102CLP	2,37	3,35	3,28	2,95	2,72	2,26	2,46	2,34	2,02	2,45	0,71	3,10	2,54	2,27	2,47	2,28	1,90	2,21	1,94	2,40
PAN7160CLP	2,70	3,76	3,14	3,47	2,36	1,97	2,37	2,47	2,36	2,82	0,79	2,90	2,79	2,36	2,19	2,36	1,66	2,16	2,40	2,48
PAN7170	2,55	3,22	2,62	3,73	2,22	2,35	2,48	1,84	1,91	2,67	0,97	2,96	2,62	2,25	2,17	2,21	1,98	2,83	1,97	2,40
PAN7180CLP	2,58	3,45	3,11	3,59	2,78	2,19	2,28	2,86	1,94	3,51	0,75	2,79	2,50	2,23	1,94	2,17	2,15	2,72	1,82	2,49
SY3970CL	2,67	2,21	2,06	2,63	3,51	1,48	2,73	1,80	1,95	2,29	0,59	2,67	2,53	2,16	1,81	1,79	1,60	2,00	1,37	2,10
Mean	2,71	3,28	3,05	3,43	2,61	1,87	2,40	2,18	2,14	2,68	0,79	2,85	2,51	2,22	2,12	2,03	1,83	2,50	2,01	2,38
CV %	14,20	13,10	8,50	16,50	10,80	20,00	12,30	16,00	14,90	14,00	19,30	11,50	7,50	11,10	9,20	8,50	15,60	9,70	19,20	

Table 8: Oil yield (t ha^{-1}) of cultivars at selected localities 2020/2021

Cultivar	Boskop 11/10/2020	Boskop 14/01/2021	Bothaville 26/01/2021	Lichtenburg 25/11/2020	Potchefstroom 30/11/2020	Potchefstroom 10/12/2020	Potchefstroom 20/01/2021	Mean
AGSUN5101CLP	1,00	1,20	1,21	1,05	0,87	0,84	0,70	0,98
AGSUN5102CLP	1,02	1,14	1,23	0,99	0,96	0,89	0,65	0,98
AGSUN5103CLP	1,28	1,26	1,40	0,91	0,99	0,85	0,73	1,06
AGSUN5106CLP	0,84	1,19	1,17	1,15	1,07	0,88	0,64	0,99
AGSUN5108CLP	0,83	1,13	1,15	1,14	0,98	0,89	0,67	0,97
AGSUN5270	0,88	1,51	1,40	1,30	1,18	1,14	0,89	1,18
AGSUN8251	0,97	1,18	1,30	0,89	0,99	0,97	0,77	1,01
AGUARA6	1,03	1,27	1,43	1,17	1,14	0,99	0,91	1,14
LG5678CLP	0,94	1,19	1,21	1,08	1,05	0,97	0,77	1,03
LG5710	1,25	1,37	1,52	1,08	1,36	1,26	0,97	1,26
P65LL02	1,15	1,38	1,60	0,79	1,04	1,14	0,91	1,14
P65LL14	0,92	1,28	1,23	0,96	0,99	1,01	0,74	1,02
P65LP54	0,70	1,19	1,22	0,80	0,95	0,87	0,79	0,93
P65LP65	0,81	1,30	1,41	1,00	1,08	0,93	0,84	1,05
PAN7080	0,96	1,29	1,43	1,17	1,08	0,95	0,82	1,10
PAN7100	0,99	1,25	1,32	1,33	1,33	1,04	0,83	1,16
PAN7102CLP	0,85	1,27	1,13	0,91	0,99	0,88	0,85	0,98
PAN7160CLP	0,95	1,31	1,31	1,19	1,20	1,00	0,95	1,13
PAN7170	1,01	1,03	1,49	1,13	1,20	1,05	0,93	1,12
PAN7180CLP	0,85	1,16	1,37	1,38	1,00	0,94	0,82	1,08
SY3970CL	1,15	0,92	1,15	1,11	1,31	1,14	0,84	1,09
Mean	0,97	1,23	1,32	1,07	1,08	0,98	0,81	1,07

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

Locality	Mean (t/ha)	SE	CV (%)	GCV	t	SE(t)	tn
Bethlehem 26/11/2020	0,31	0,30	39,40	.	-0,06	0,12	-0,20
BOSKOP1 11/10/2020	2,71	0,22	14,20	9,10	0,29	0,15	0,55
BOSKOP2 30/11/2020	3,28	0,25	13,10	9,50	0,34	0,14	0,61
BOSKOP3 14/01/2021	3,05	0,15	8,50	9,40	0,55	0,12	0,79
BOTHAVILLE 26/01/2021	3,43	0,33	16,50	.	-0,02	0,13	-0,06
Coligny 30/11/2020	2,61	0,16	10,80	10,80	0,50	0,13	0,75
Fauresmith 23/01/2021	1,87	0,22	20,60	7,50	0,12	0,14	0,29
Gerdau 2020/12/02	2,40	0,17	12,30	9,20	0,36	0,14	0,63
KLIPDRIFDAM 22/12/2020	2,18	0,20	16,00	12,00	0,36	0,14	0,63
Kroonstad 2/12/2020	2,14	0,18	14,90	4,80	0,09	0,14	0,23
Kroonstad 28/12/2020	2,33	0,37	27,30	25,70	0,47	0,13	0,73
Lichtenburg 26/11/2020	1,73	0,22	22,50	.	-0,03	0,13	-0,10
LICHTENBURG 25/11/2020	2,68	0,22	14,00	9,90	0,33	0,14	0,60
Petrusburg 22/01/2020	0,79	0,09	19,30	6,60	0,10	0,14	0,25
Potchefstroom 11/23/2020	2,85	0,19	11,50	3,10	0,07	0,14	0,18
Potchefstroom 30/11/2020	2,51	0,11	7,50	6,10	0,40	0,14	0,67
Potchefstroom 10/12/2020	2,22	0,14	11,10	.	-0,03	0,13	-0,10
Potchefstroom 05/12/2020	1,46	0,23	27,20	4,70	0,03	0,13	0,08
Potchestroom 04/01/2021	2,12	0,11	9,20	5,40	0,26	0,15	0,51
Potchestroom 21/01/2021	2,03	0,10	8,50	6,70	0,38	0,14	0,65
SANNIESHOF 18/01/2021	1,83	0,16	15,60	6,20	0,14	0,14	0,33
Senekal 3/12/2020	1,72	0,32	32,00	.	-0,02	0,13	-0,06
VENTERSDORP1 12/10/2020	2,50	0,14	9,70	9,40	0,48	0,13	0,73
VENTERSDORP 19/01/2021	1,13	0,24	36,30	11,00	0,08	0,14	0,21
WOLMARANSTAD 08/01/2021	2,01	0,22	19,20	14,70	0,37	0,14	0,64

Table 10: Regression line coordinates at different yield potentials 2020/2021

Cultivar	Yield potential (t ha^{-1})						Mean (t ha^{-1})	Intercept	Slope	Fprob	R^2
	1	1,5	2	2,5	3	3,5					
AGSUN5101CLP	0,82	1,37	1,92	2,47	3,02	3,57	2,33	-0,28	1,10	<0.001	0,93
AGSUN5102CLP	0,99	1,49	1,99	2,49	2,99	3,49	2,38	-0,01	1,00	<0.001	0,93
AGSUN5103CLP	0,86	1,46	2,06	2,66	3,26	3,86	2,51	-0,34	1,20	<0.001	0,85
AGSUN5106CLP	0,89	1,46	2,02	2,59	3,15	3,72	2,44	-0,24	1,13	<0.001	0,91
AGSUN5108CLP	0,94	1,44	1,94	2,44	2,94	3,44	2,32	-0,06	1,00	<0.001	0,95
AGSUN5270	1,02	1,56	2,09	2,63	3,16	3,70	2,50	-0,05	1,07	<0.001	0,89
AGSUN8251	1,17	1,65	2,12	2,60	3,07	3,55	2,49	0,22	0,95	<0.001	0,84
AGUARA6	1,02	1,50	1,97	2,45	2,92	3,40	2,33	0,07	0,95	<0.001	0,83
LG5678CLP	0,95	1,38	1,81	2,24	2,67	3,10	2,14	0,09	0,86	<0.001	0,93
LG5710	0,89	1,41	1,93	2,45	2,97	3,49	2,33	-0,15	1,04	<0.001	0,86
P65LL02	0,96	1,47	1,98	2,49	3,00	3,51	2,37	-0,06	1,02	<0.001	0,79
P65LL14	1,01	1,48	1,94	2,41	2,87	3,34	2,30	0,08	0,93	<0.001	0,92
P65LP54	1,10	1,58	2,06	2,54	3,02	3,50	2,43	0,14	0,96	<0.001	0,81
P65LP65	0,99	1,49	1,99	2,49	2,99	3,49	2,37	-0,01	1,00	<0.001	0,86
PAN7080	0,84	1,42	1,99	2,57	3,14	3,72	2,43	-0,31	1,15	<0.001	0,91
PAN7100	1,11	1,59	2,07	2,55	3,03	3,51	2,44	0,15	0,96	<0.001	0,85
PAN7102CLP	1,16	1,61	2,06	2,51	2,96	3,41	2,40	0,26	0,90	<0.001	0,85
PAN7160CLP	1,06	1,57	2,08	2,59	3,10	3,61	2,48	0,04	1,02	<0.001	0,90
PAN7170	1,15	1,60	2,05	2,50	2,95	3,40	2,40	0,25	0,90	<0.001	0,83
PAN7180CLP	1,05	1,58	2,10	2,63	3,15	3,68	2,49	0,00	1,05	<0.001	0,84
SY3970CL	1,01	1,41	1,80	2,20	2,59	2,99	2,10	0,22	0,79	<0.001	0,55

Table 11: Yield probability (%) of cultivars for 2020/2120 at different yield potentials

Cultivar	Yield potential (t ha^{-1})						Regression line	
	1	1,5	2	2,5	3	3,5	Fprob	R2
AGSUN5101CLP	21	27	35	44	54	63	<0.001	0,93
AGSUN5102CLP	48	48	48	48	48	48	<0.001	0,93
AGSUN5103CLP	35	45	58	70	79	85	<0.001	0,85
AGSUN5106CLP	33	43	54	66	75	82	<0.001	0,91
AGSUN5108CLP	37	36	35	35	35	36	<0.001	0,95
AGSUN5270	53	60	66	72	76	79	<0.001	0,89
AGSUN8251	72	71	68	65	61	57	<0.001	0,84
AGUARA6	53	50	46	43	39	37	<0.001	0,83
LG5678CLP	39	24	13	6	3	1	<0.001	0,93
LG5710	36	38	40	43	46	49	<0.001	0,86
P65LL02	46	47	48	49	50	51	<0.001	0,79
P65LL14	52	46	38	32	25	22	<0.001	0,92
P65LP54	62	60	58	55	53	50	<0.001	0,81
P65LP65	49	49	48	48	48	49	<0.001	0,86
PAN7080	26	37	48	62	73	82	<0.001	0,91
PAN7100	65	63	61	58	55	51	<0.001	0,85
PAN7102CLP	72	67	60	52	44	37	<0.001	0,85
PAN7160CLP	59	62	64	66	67	67	<0.001	0,90
PAN7170	70	65	58	50	42	36	<0.001	0,83
PAN7180CLP	56	60	63	67	69	71	<0.001	0,84
SY3970CL	51	43	33	25	19	15	<0.001	0,55

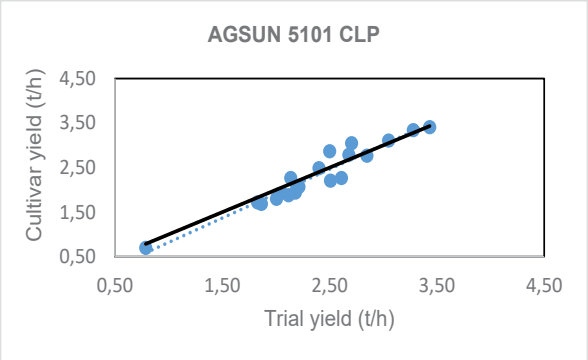
Table 12: Yield probability (%) of cultivars 2019/2020 and 2020/2021 at different yield potentials

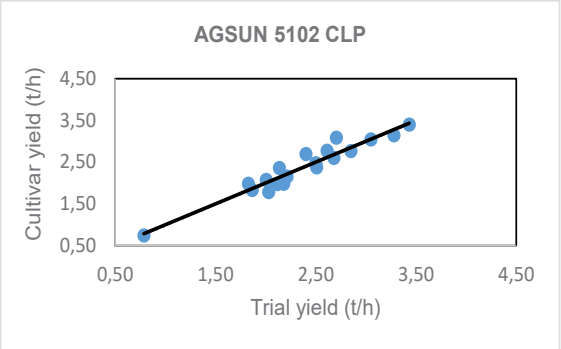
	Yield potential (t/ha)						Regression line	
	1	1,5	2	2,5	3	3,5	Fprob	R2
AGSUN5101CLP	41	42	44	46	47	49	<0.001	0,90
AGSUN5102CLP	47	49	50	52	53	54	<0.001	0,90
AGSUN5103CLP	44	49	53	58	62	67	<0.001	0,91
AGSUN5106CLP	39	45	51	57	63	69	<0.001	0,94
AGSUN5270	66	64	61	59	56	53	<0.001	0,80
AGSUN8251	51	52	54	56	57	59	<0.001	0,83
LG5678CLP	40	35	31	27	23	20	<0.001	0,86
LG5710	48	46	44	41	39	38	<0.001	0,84
P65LL02	44	46	47	49	51	53	<0.001	0,88
P65LL14	48	48	48	48	48	48	<0.001	0,80
P65LP54	59	57	54	51	48	45	<0.001	0,81
PAN7080	38	45	51	58	64	70	<0.001	0,82
PAN7100	60	60	60	60	59	59	<0.001	0,90
PAN7102CLP	64	61	56	52	47	43	<0.001	0,86
PAN7160CLP	51	55	57	61	64	67	<0.001	0,93
PAN7170	61	58	56	54	52	49	<0.001	0,91
SY3970CL	48	44	38	34	29	26	<0.001	0,88

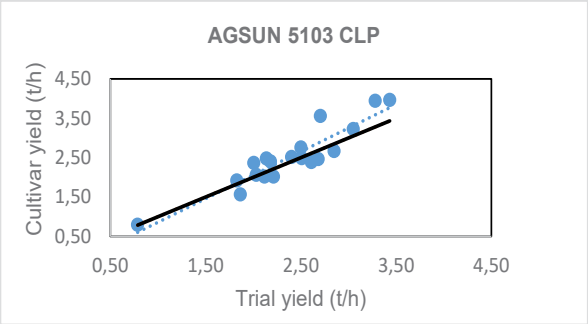
Table 13: Yield probability (%) of cultivars for three years' data 2018/2019 to 2020/2021 at different yield potentials

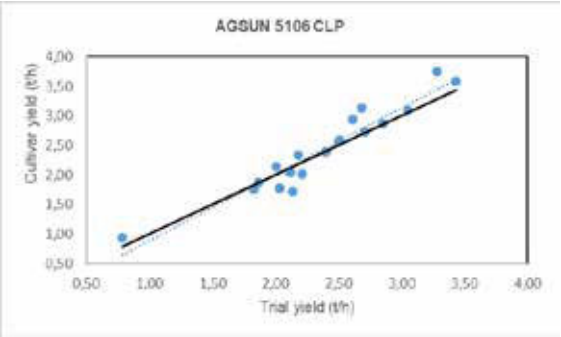
	Yield potential (t/ha)						Regression line	
	1	1,5	2	2,5	3	3,5	Fprob	R2
AGSUN5101CLP	43	44	45	46	47	47	<0.001	0,91
AGSUN5102CLP	50	50	49	49	48	48	<0.001	0,92
AGSUN5103CLP	42	47	51	55	59	64	<0.001	0,89
AGSUN5106CLP	37	43	50	57	63	70	<0.001	0,93
AGSUN5270	65	64	62	60	58	57	<0.001	0,83
AGSUN8251	56	57	57	58	58	58	<0.001	0,90
LG5678CLP	41	36	31	27	23	19	<0.001	0,89
LG5710	49	47	45	43	41	40	<0.001	0,82
P65LL02	47	48	49	51	52	53	<0.001	0,83
P65LL14	50	50	50	50	50	50	<0.001	0,89
P65LP54	57	55	52	50	47	45	<0.001	0,84
PAN7080	46	51	56	61	66	70	<0.001	0,92
PAN7100	60	59	56	54	52	50	<0.001	0,90
PAN7102CLP	67	63	58	54	49	45	<0.001	0,87
PAN7160CLP	48	52	55	59	63	66	<0.001	0,93
SY3970CL	42	39	36	34	31	28	<0.001	0,76

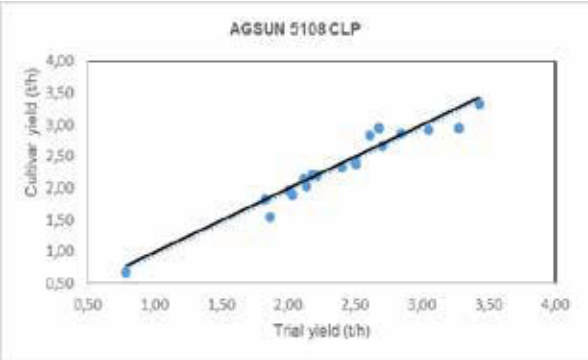
Figure 1: Regression lines for cultivars 2020/2021

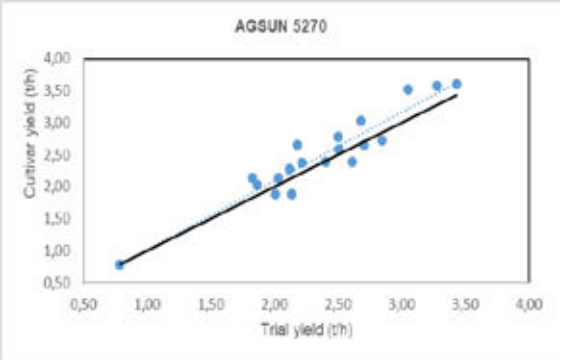


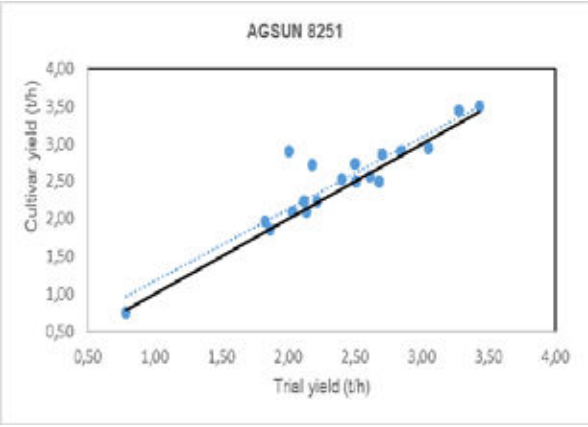


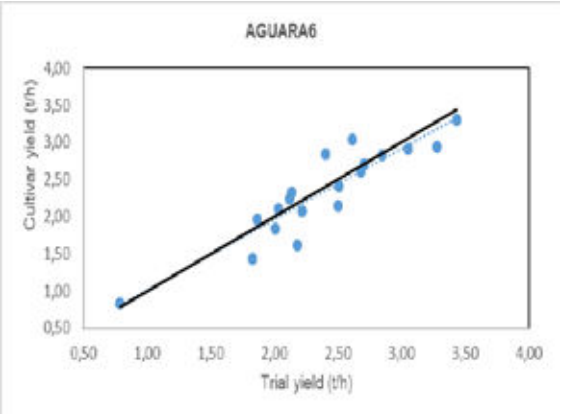


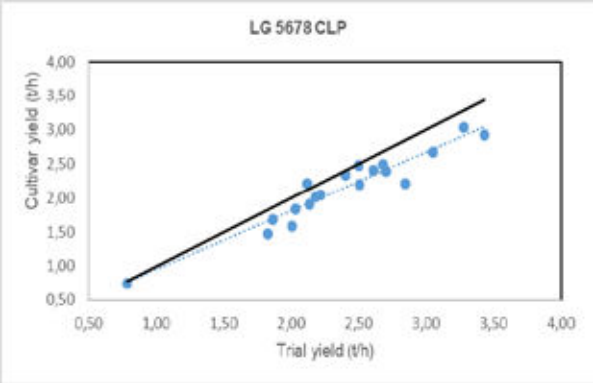


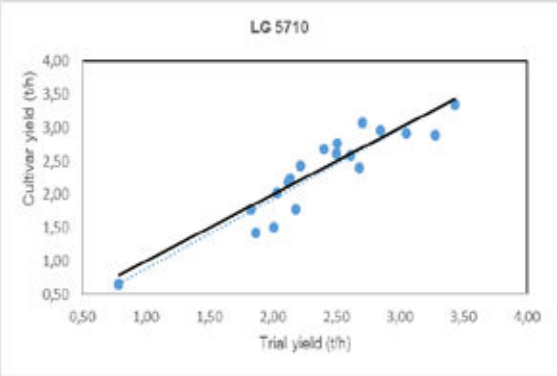


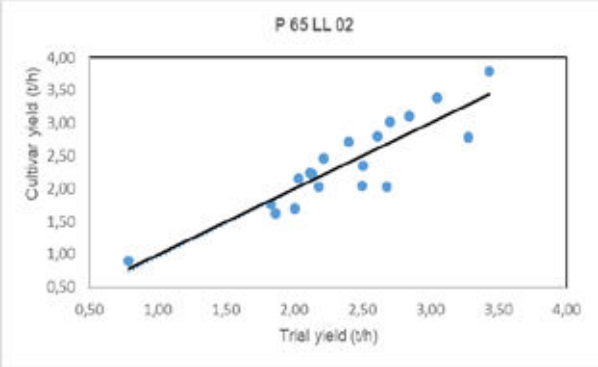


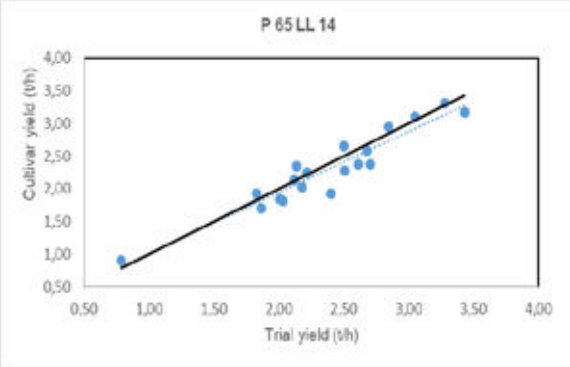


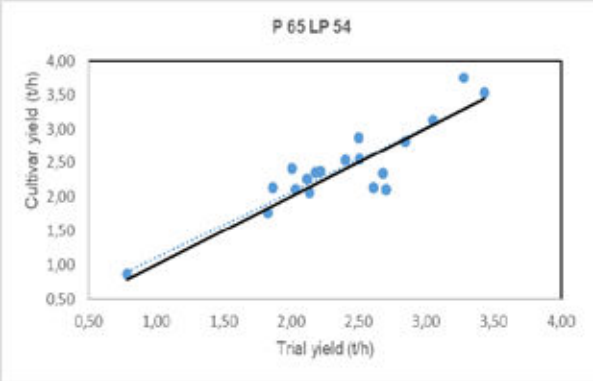


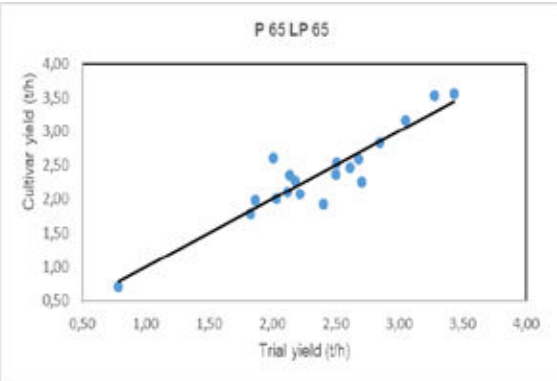

LG 5678 CLP
Cultivar yield (t/h)
Trial yield (t/h)

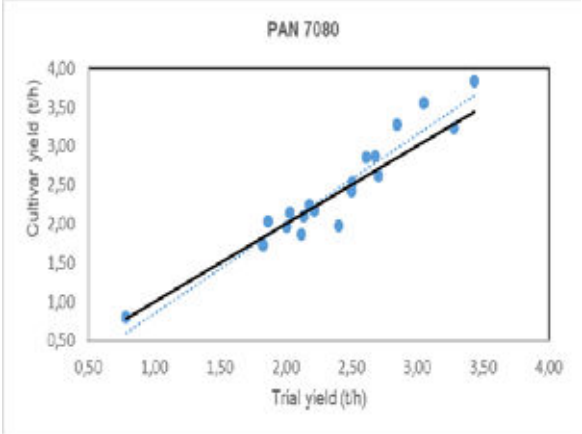

LG 5710
Cultivar yield (t/h)
Trial yield (t/h)

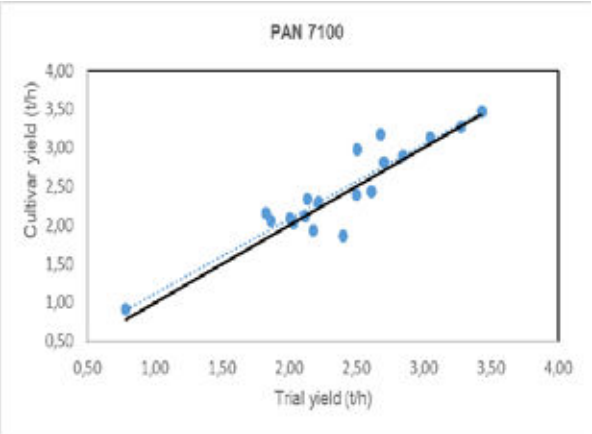

P 65 LL 02
Cultivar yield (t/h)
Trial yield (t/h)

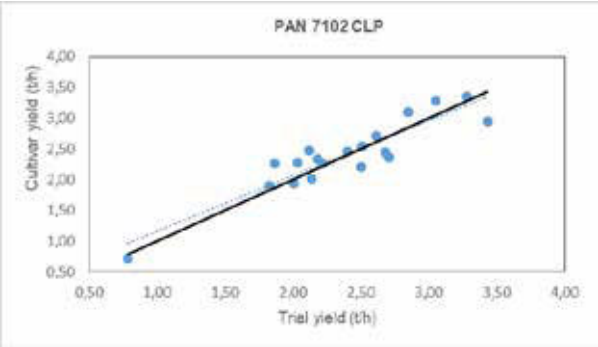

P 65 LL 14
Cultivar yield (t/h)
Trial yield (t/h)

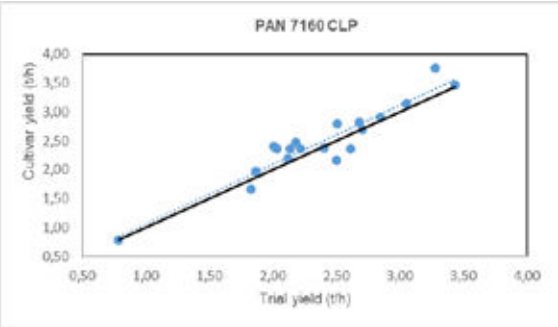

P 65 LP 54
Cultivar yield (t/h)
Trial yield (t/h)

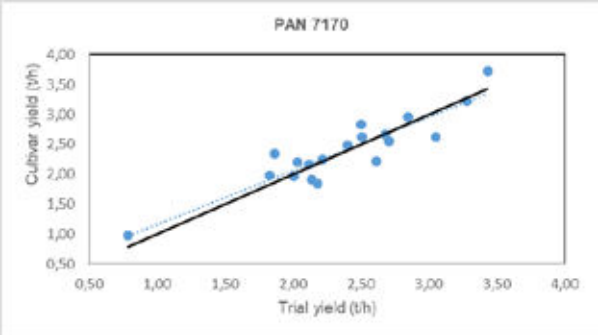

P 65 LP 65
Cultivar yield (t/h)
Trial yield (t/h)

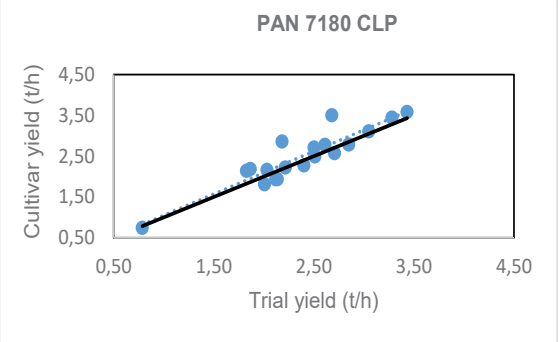

PAN 7080
Cultivar yield (t/h)
Trial yield (t/h)


PAN 7100
Cultivar yield (t/h)
Trial yield (t/h)


PAN 7102 CLP
Cultivar yield (t/h)
Trial yield (t/h)


PAN 7160 CLP
Cultivar yield (t/h)
Trial yield (t/h)


PAN 7170
Cultivar yield (t/h)
Trial yield (t/h)


PAN 7180 CLP
Cultivar yield (t/h)
Trial yield (t/h)

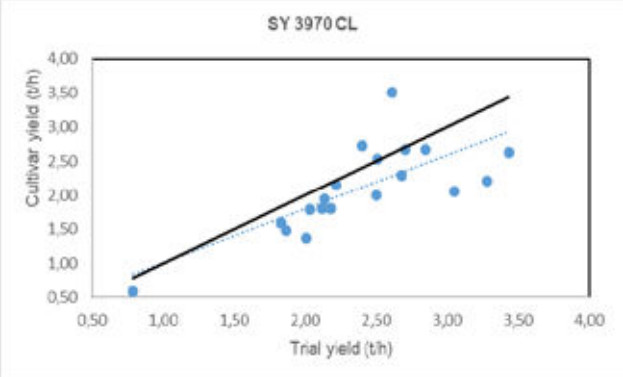
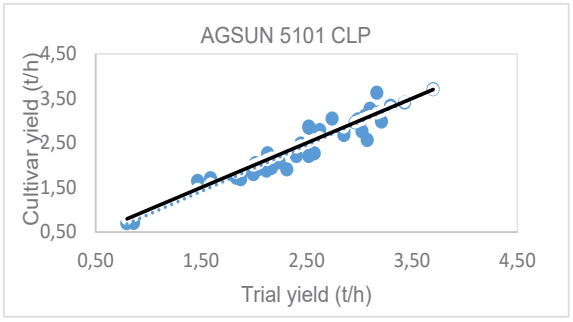
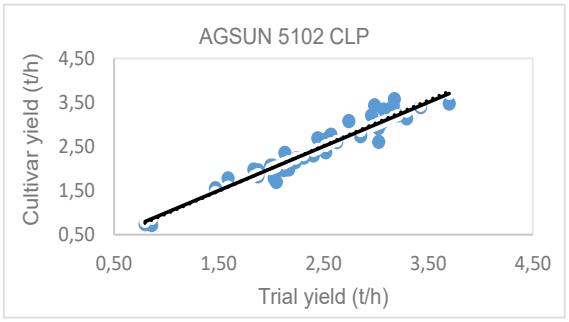
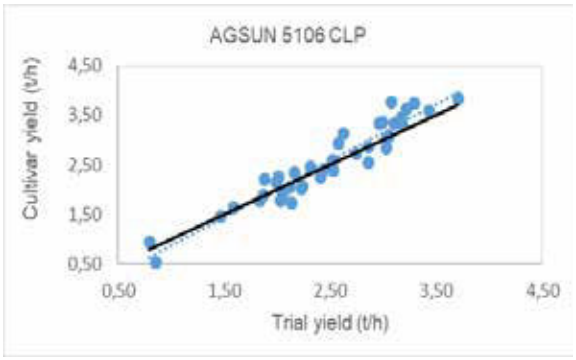
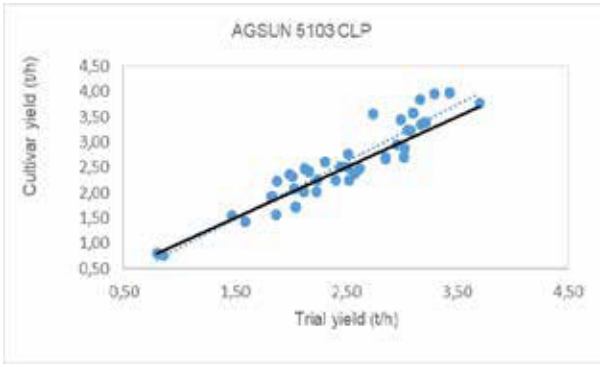

SY 3970 CL
Cultivar yield (t/h)
Trial yield (t/h)

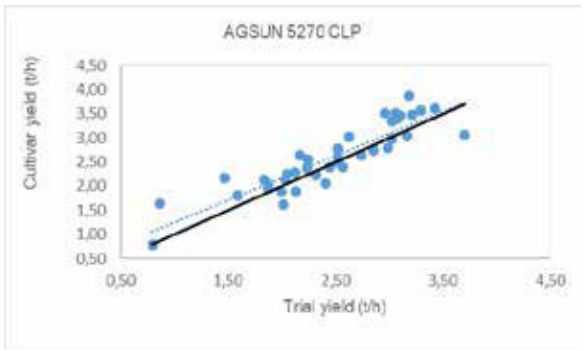
Figure 2: Regression lines for cultivars 2019/2020 &2020/2021

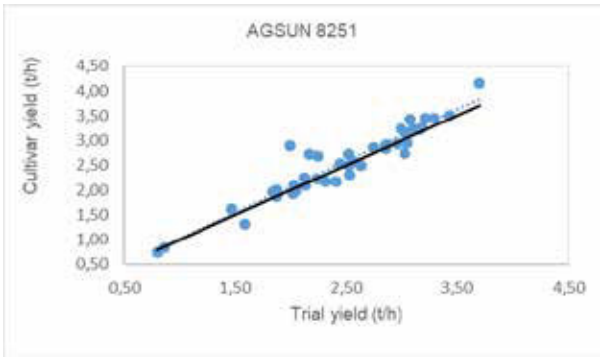


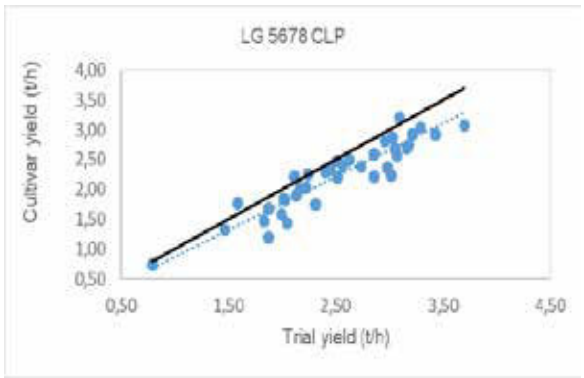


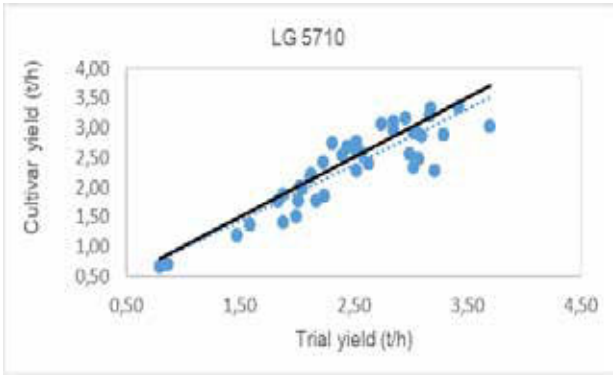


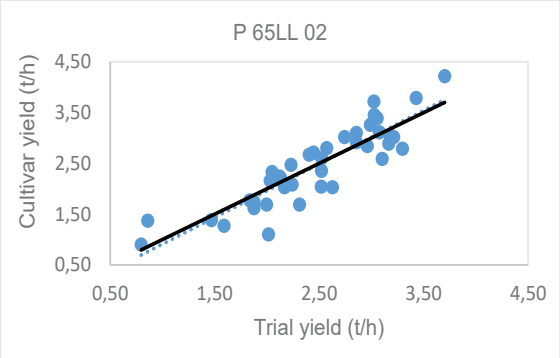


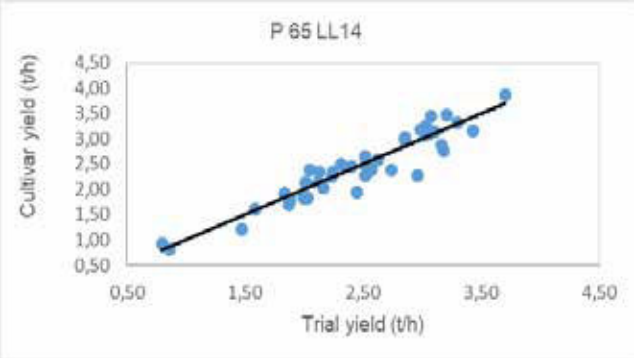









P 65LL 02
Cultivar yield (t/h)
Trial yield (t/h)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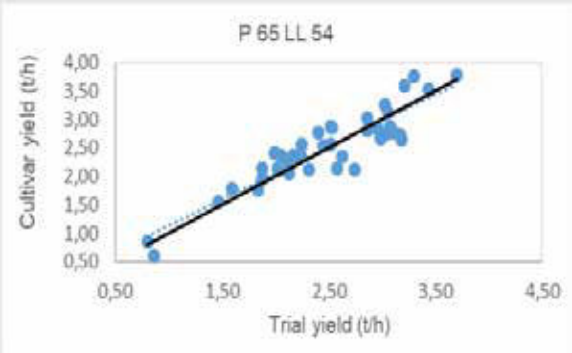
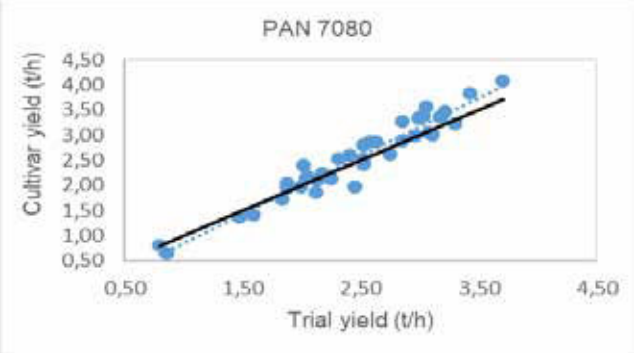
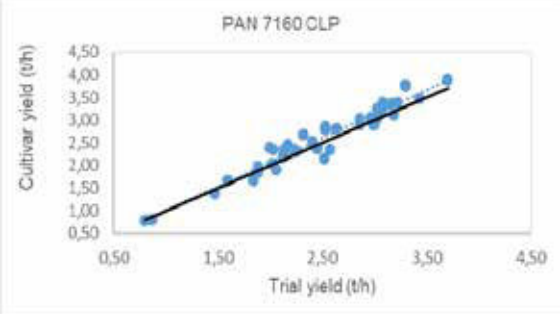
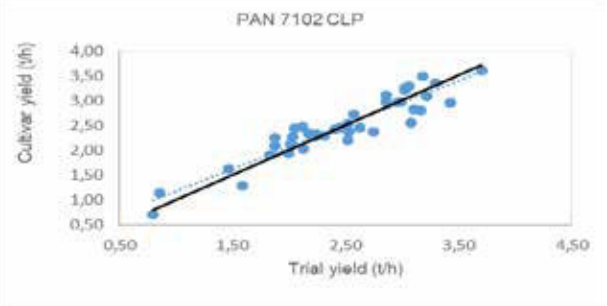
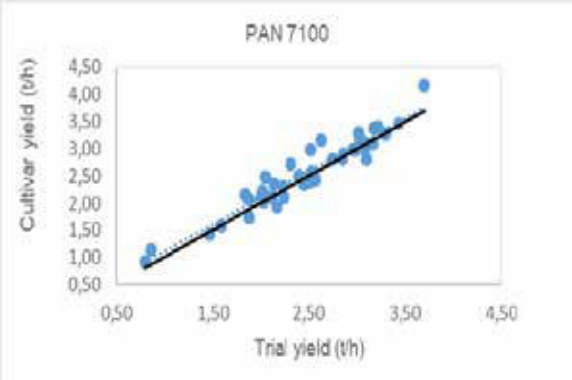
Trial yield (t/h)

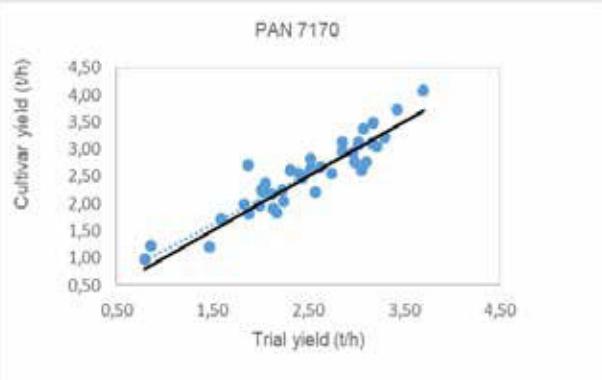

P 65 LL 54
Cultivar yield (t/h)
Trial yield (t/h)

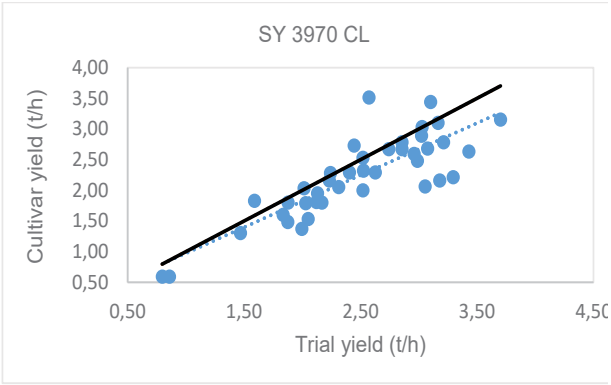

PAN 7080
Cultivar yield (t/h)
Trial yield (t/h)


PAN 7160 CLP
Cultivar yield (t/h)
Trial yield (t/h)


PAN 7102 CLP
Cultivar yield (t/h)
Trial yield (t/h)


PAN 7100
Cultivar yield (t/h)
Trial yield (t/h)


PAN 7170
Cultivar yield (t/h)
Trial yield (t/h)


SY 3970 CL
Cultivar yield (t/h)
4,00
3,50
3,00
2,50
2,00
1,50
1,00
0,50
0,50
1,50
2,50
3,50
Trial yield (t/h)

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%