



South African Sorghum crop

Quality Report
2018/2019 season

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South African

Commercial sorghum quality for the
2018/2019 Season



Acknowledgements

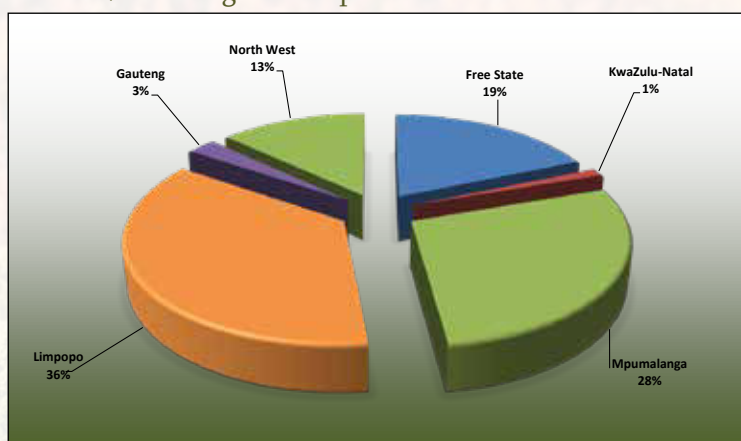
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- *South African Grain Information Service (SAGIS) for providing supply and demand figures relating to sorghum.*
- *The Bureau for Food and Agricultural Policy (BFAP) for providing research based market analysis.*

Introduction

The final commercial sorghum crop figure of the 2018/19 production season as overseen by the National Crop Estimates Liaison Committee (CELC) is 127 0000 tons. The crop increased by just more than 10% (12 000 tons) year on year. Limpopo, the major sorghum producing province this season, contributed 36% of the total crop. Yield figures showed a 37% decrease year on year, from 3.99 t/ha to 2.51 t/ha.

Graph 1: Contribution of the provinces to the production of the 2018/2019 sorghum crop



Figures provided by the CEC.

During the harvesting season, a representative sample of each delivery of sorghum 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 32. Thirty-one (31) composite sorghum samples, representing the different production regions, were analysed for quality.

The samples were graded and test weight and thousand kernel mass determined. Sub-samples were milled and analysed for moisture, crude protein and starch. After sieving and dehulling by means of a Barley pearler, the fraction of the sample above the 1.8 mm slotted sieve were milled and Hunter Lab colour analyses conducted. Multi-mycotoxin analyses as well as Image analyses (kernel size distribution, length, width, relative roundness and volume to surface ratio on the whole kernels) were also performed on the samples.

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

The goal of this crop quality survey is the compilation of a detailed database, accumulating quality data collected over several seasons on the national commercial sorghum crop. The data reveal general tendencies and highlight quality differences in the commercial sorghum produced in different local production regions. A detailed database containing reliable analytical data collected over several seasons, is essential in enabling industry to comment on proposed legislative levels and to supply reliable data for targeted research projects.

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 are also included.

Data on sorghum imported for domestic use during the period March 2019 to February 2020 is included in the report and compared to the quality of the local crop during the 2018/19 production season. To assist with quality comparisons between local and imported sorghum, the same scope of analysis is used for both sets of samples.

The national sorghum grading regulations as published in the Government Gazette of 8 January 2016 are provided as the last section of the report.

Production

Sorghum is a tropical grass grown primarily in semi-arid regions of the world. Sorghum can grow in areas too dry for maize and is deemed to be the fifth most important grain crop grown in the world (after maize, wheat, rice and barley).

World sorghum production for the 2019/20 season to date, stands at 58.5 million tons with the United States being the largest contributor (8.7 million tons). Please see Table 1a for the world sorghum trade (import and export figures) as well as production and consumption figures in Table 1b.

The local area utilised for sorghum production increased by 75%, compared to the 28 800 hectares of the 2017/18 season. The 50 500 hectares planted this season, is the largest area planted since the 2014/15 season when 70 500 hectares were planted.

Table 1a: World Sorghum Trade October/September Trade Year, Thousand Metric Tons						
	2015/16	2016/17	2017/18	2018/19	2019/20 Feb	2019/20 Mar
Exports						
Argentina	772	457	329	196	200	200
Australia	717	542	449	91	50	40
China	23	34	43	49	40	40
Ethiopia	75	75	75	75	75	75
India	74	24	123	53	50	50
Nigeria	50	100	100	100	100	100
Ukraine	119	164	123	93	100	100
Others	133	311	306	196	102	99
Subtotal	1 963	1 707	1 548	853	717	704
United States	7 918	6 031	4 839	2 479	3 000	3 400
World Total	9 881	7 738	6 387	3 332	3 717	4 104
Imports						
Chile	134	54	73	46	100	100
China	8 284	5 209	4 436	652	900	1 300
Colombia	64	0	56	0	50	50
European Union	119	194	486	666	250	200
Japan	649	561	594	452	500	500
Kenya	54	146	141	109	150	150
Mexico	661	548	98	596	700	700
South Africa	83	82	27	59	50	50
South Sudan	19	36	148	26	150	150
Sudan	200	120	150	160	200	200
Others	596	364	513	509	439	439
Subtotal	10 863	7 314	6 722	3 275	3 489	3 839
Unaccounted	- 1 080	380	- 386	56	227	264
United States	98	44	51	1	1	1
World Total	9 881	7 738	6 387	3 332	3 717	4 104

Table 1b: World Sorghum Production and Consumption Local Marketing Years, Thousand Metric Tons						
	2015/16	2016/17	2017/18	2018/19	2019/20 Feb	2019/20 Mar
Production						
Argentina	3 375	3 400	3 000	2 500	2 500	2 500
Australia	802	557	1 023	780	871	871
Brazil	1 032	1 865	2 136	2 177	2 100	2 100
Burkina	1 436	1 663	1 366	1 930	1 800	1 800
Cameroon	1 217	1 339	1 352	1 200	1 200	1 200
Chad	835	991	946	988	950	950
China	2 203	2 235	2 465	3 450	3 600	3 600
Ethiopia	4 766	4 752	5 170	5 150	5 200	5 200
India	674	632	660	737	820	820
Mali	4 238	4 568	4 803	3 475	4 500	4 400
Mexico	1 527	1 394	1 424	1 470	1 300	1 300
Niger	5 587	4 638	4 545	4 700	4 500	4 500
Nigeria	1 918	1 808	1 945	2 100	1 900	1 900
Sudan	7 005	7 556	6 939	6 800	6 900	6 900
Tanzania	2 744	6 466	3 743	4 953	4 000	4 000
Other	7 981	7 232	7 571	7 845	6 744	6 744
Subtotal	47 340	51 096	49 088	50 255	48 885	48 785
United States	15 158	12 199	9 192	9 271	8 673	8 673
World Total	62 498	63 295	58 280	59 526	57 558	57 458
Total Consumption						
Argentina	2 900	2 900	3 200	2 400	2 300	2 400
Brazil	1 150	1 700	2 100	2 200	2 100	2 100
Burkina	1 465	1 640	1 400	1 800	1 800	1 800
Cameroon	1 232	1 369	1 367	1 225	1 225	1 225
Chad	850	950	1 000	1 000	1 000	1 000
China	10 500	7 400	6 900	4 100	4 400	4 700
Ethiopia	4 700	4 700	5 000	5 100	5 100	2 100
European Union	800	790	970	1 520	1 070	1 020
India	4 600	4 500	4 600	3 550	4 400	4 300
Mali	1 500	1 400	1 450	1 500	1 400	1 400
Mexico	6 300	5 300	4 700	5 100	5 250	5 250
Niger	2 000	2 000	1 850	2 100	2 050	2 050
Nigeria	6 905	7 350	6 950	6 750	6 800	6 800
South Sudan	830	760	800	685	850	850
Sudan	3 100	5 950	4 400	4 900	4 450	4 450
Others	8 445	7 574	8 462	8 827	8 014	8 014
Subtotal	56 947	56 646	54 775	52 575	52 484	52 752
United States	6 130	6 283	4 119	6 189	6 223	5 969
World Total	63 077	62 929	58 894	58 764	58 707	58 721

Notes:

World totals for consumption reflect total utilisation, including food, seed, industrial, feed and waste, as well as differences in local marketing year imports and exports.

Consumption statistics for regions and individual countries reflect food, seed, industrial, feed and waste only.

Source: United States Department of Agriculture, Foreign Agricultural Service (USDA-FAS), Grain: World Markets and Trade report, March 2020.

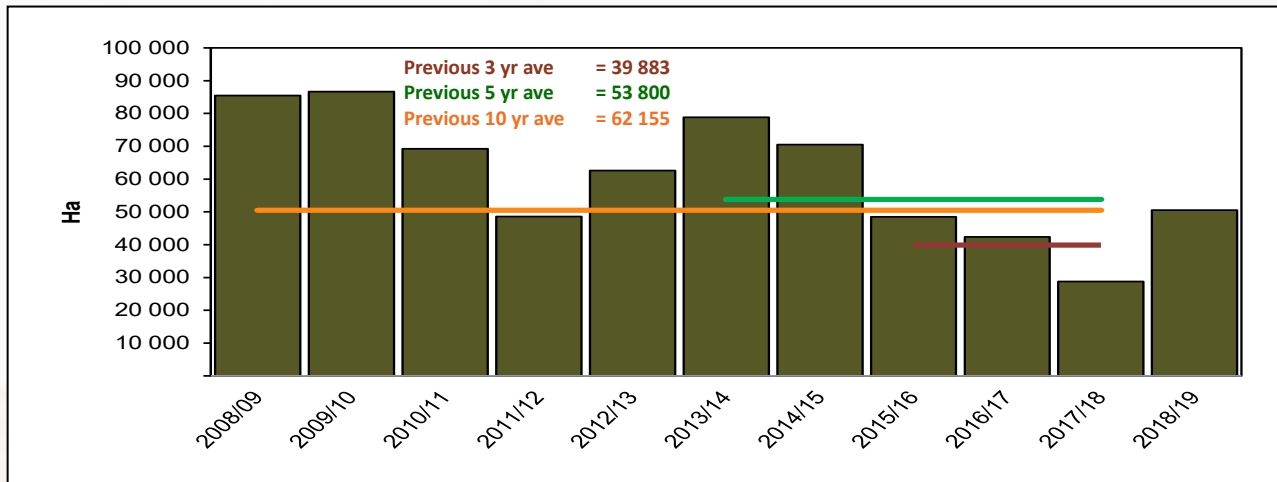
According to The Bureau for Food and Agricultural Policy (BFAP) Baseline, Agricultural Outlook 2019 – 2028, when looking at the outlook for field crops, specifically summer grains and oilseeds, the smallest yield improvement is evident for sorghum, which is in line with past trends. Failure of yield growth to keep up with alternative crops such as yellow maize, can be ascribed as one of the reasons for consistent decline in area in the past.

Please see Table 2 for an overview of sorghum production under dry land conditions versus irrigation in the 2018/19 season, compared to the 2017/18 season. Graphs 2 to 4 provide national figures with regards to hectares planted, tons produced and yields obtained over the last 11 seasons. Graphs 5 to 10 on page 6 provide similar figures for the major sorghum producing provinces this season, namely Limpopo, Mpumalanga and the Free State.

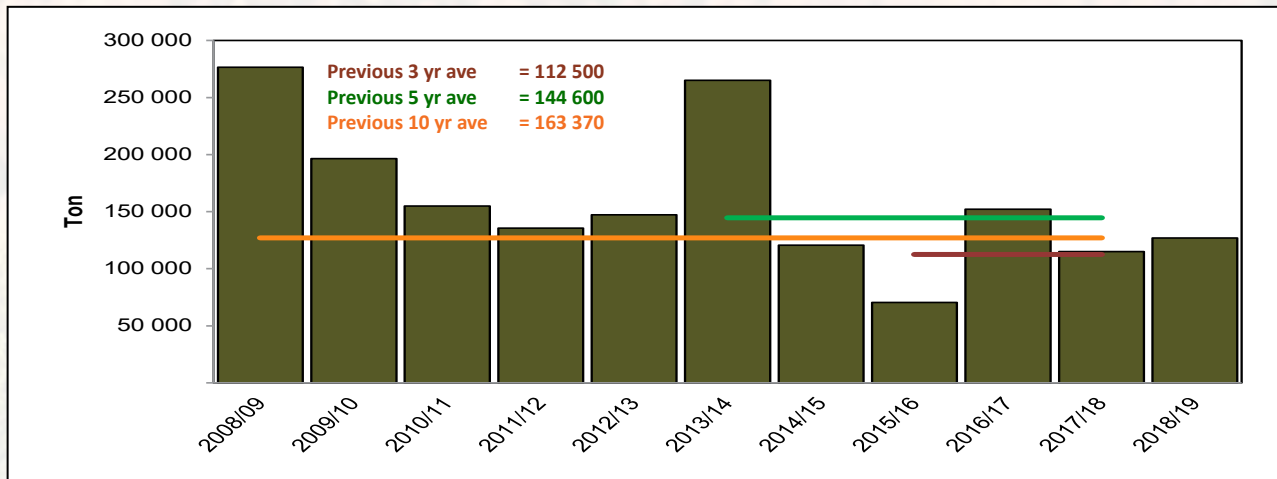
Table 2: Sorghum production overview over two seasons							
Province	Type of production	2018/19			2017/18		
		Hectares planted, ha	Production, tons	Yield, t/ha	Hectares planted, ha	Production, tons	Yield, t/ha
Western Cape	Dryland	-	-	-	-	-	-
	Irrigation	-	-	-	-	-	-
	Total	-	-	-	-	-	-
Northern Cape	Dryland	-	-	-	-	-	-
	Irrigation	-	-	-	-	-	-
	Total	-	-	-	-	-	-
Free State	Dryland	8 000	23 600	2.95	6 000	23 600	3.93
	Irrigation	-	-	-	300	1 600	5.33
	Total	8 000	23 600	2.95	6 300	25 200	4.00
Eastern Cape	Dryland	-	-	-	-	-	-
	Irrigation	-	-	-	-	-	-
	Total	-	-	-	-	-	-
KwaZulu-Natal	Dryland	500	1 500	3.00	500	2 200	4.40
	Irrigation	-	-	-	-	-	-
	Total	500	1 500	3.00	500	2 200	4.40
Mpumalanga	Dryland	7 500	36 000	4.80	7 500	40 500	5.40
	Irrigation	-	-	-	-	-	-
	Total	7 500	36 000	4.80	7 500	40 500	5.40
Limpopo	Dryland	24 650	44 625	1.81	5 000	15 500	3.10
	Irrigation	350	1 500	4.29	-	-	-
	Total	25 000	46 125	1.85	5 000	15 500	3.10
Gauteng	Dryland	1 000	3 200	3.20	1 500	4 950	3.30
	Irrigation	-	-	-	-	-	-
	Total	1 000	3 200	3.20	1 500	4 950	3.30
North West	Dryland	8 300	15 725	1.89	7 700	25 050	3.25
	Irrigation	200	850	4.25	300	1 600	5.33
	Total	8 500	16 575	1.95	8 000	26 650	3.33
RSA	Dryland	49 950	124 650	2.50	28 200	111 800	3.96
	Irrigation	550	2 350	4.27	600	3 200	5.33
	Total	50 500	127 000	2.51	28 800	115 000	3.99

Figures provided by the CEC.

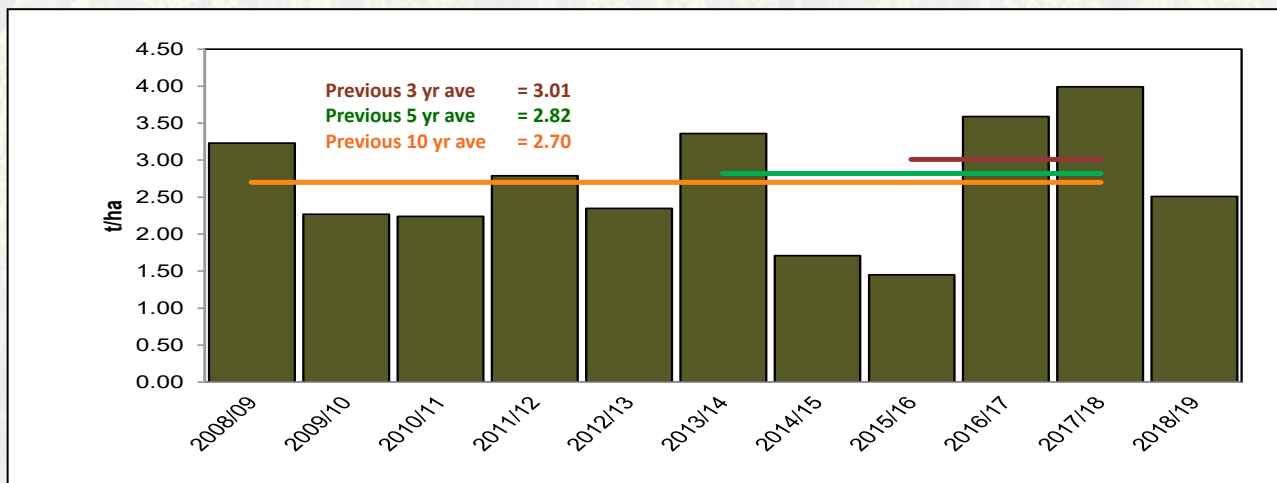
Graph 2: Total RSA area utilised for sorghum production from 2008/09 to 2018/19



Graph 3: Sorghum production in RSA from 2008/09 to 2018/19

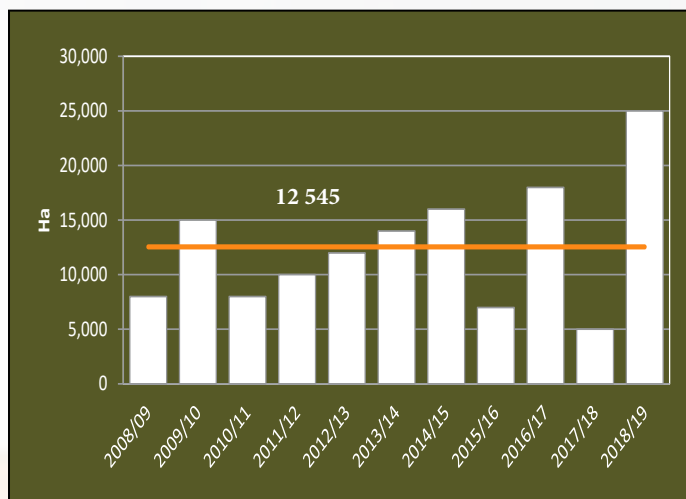


Graph 4: RSA Sorghum yield from 2008/09 to 2018/19

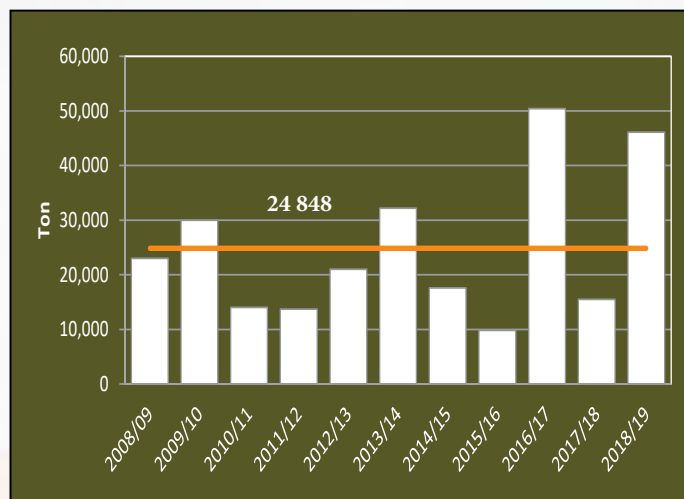


Figures provided by the CEC.

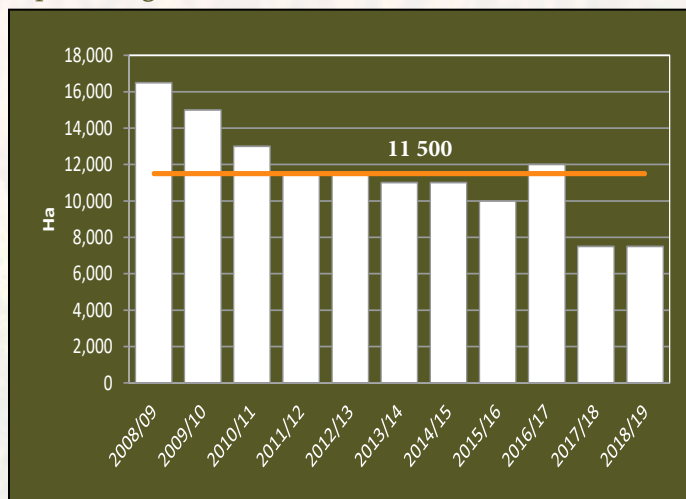
Graph 5: Area utilised for sorghum production in Limpopo since 2008/09



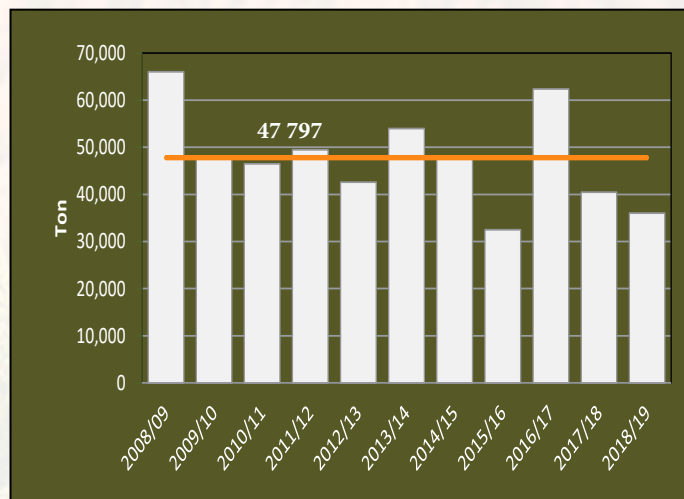
Graph 6: Sorghum production in Limpopo since 2008/09



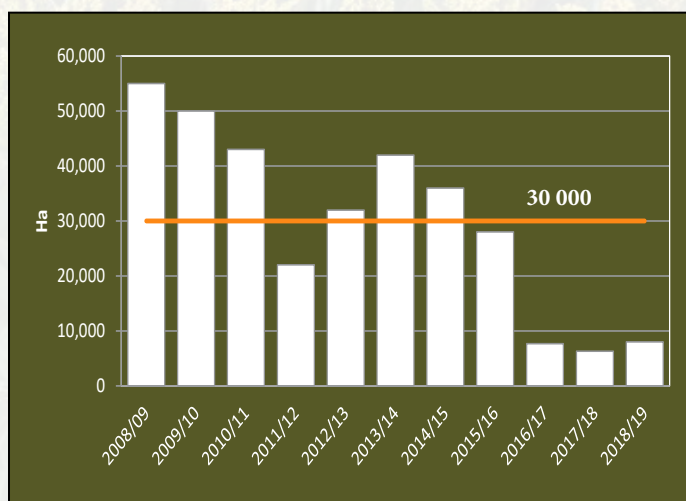
Graph 7: Area utilised for sorghum production in Mpumalanga since 2008/09



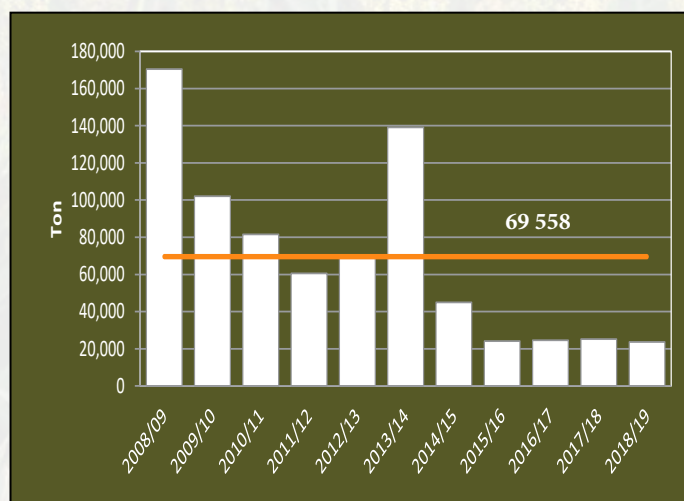
Graph 8: Sorghum production in Mpumalanga since 2008/09



Graph 9: Area utilised for sorghum production in Free State since 2008/09



Graph 10: Sorghum production in Free State since 2008/09



Figures provided by the CEC.

— Eleven season average

Supply and Demand

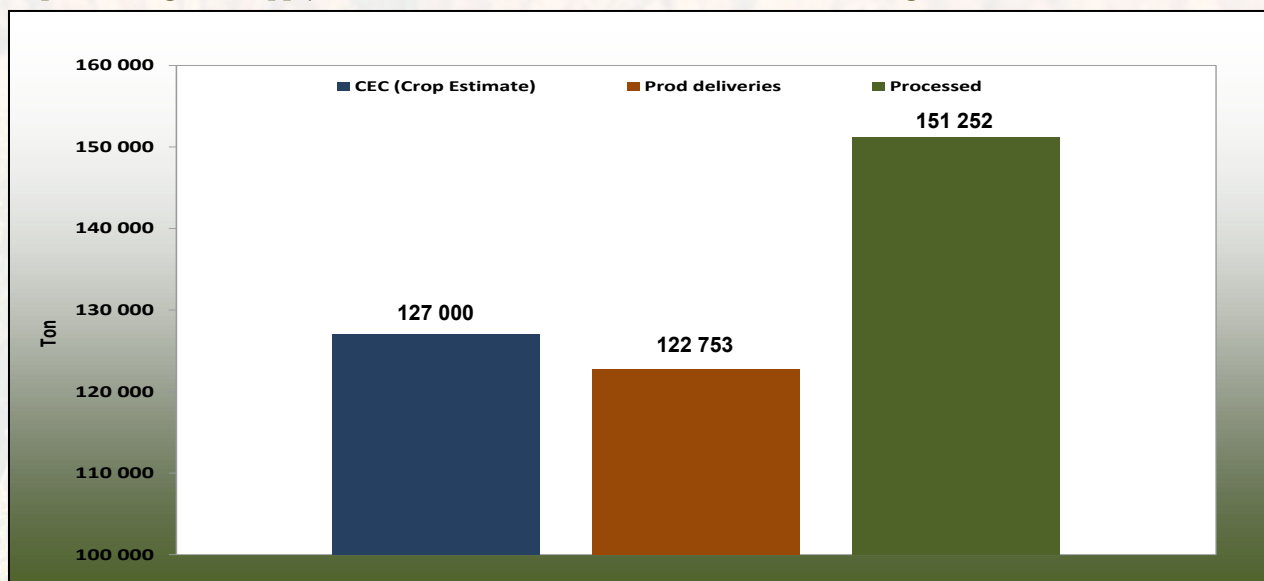
The sorghum marketing season dates from March to February. According to SAGIS supply and demand figures for the 2019/20 marketing season to date (March 2019 to January 2020), opening stock decreased by 12% compared to the previous marketing season and is 30% lower than the ten-year average.

To date, 59 014 tons of sorghum have been imported, compared to the 45 739 and 55 824 tons of the previous two seasons respectively. A subsample of all samples drawn by inspectors of the South African Agricultural Food, Quarantine and Inspection Services (SAAFQIS) of the Department of Agriculture, Forestry and Fisheries (DAFF/DALRRD) is forwarded to the SAGL for analysis. Please see pages 30 and 31 for the quality of the sorghum imported from the USA and Argentina between March 2019 and February 2020.

Of the 151 252 tons of sorghum processed so far, 36% was used for malting purposes and 58% was processed as meal, rice and grits. This ratio has remained steady for the last six years. The remainder of the sorghum was processed for pet food and animal feed.

Exports to date amount to 6 886 tons, compared to 9 482 tons last season and the ten-year average of 23 419 tons. Globally, the United States are by far the largest exporter of sorghum, followed by Argentina (*United States Department of Agriculture, Foreign Agricultural Service (USDA FAS), March 2020 report*).

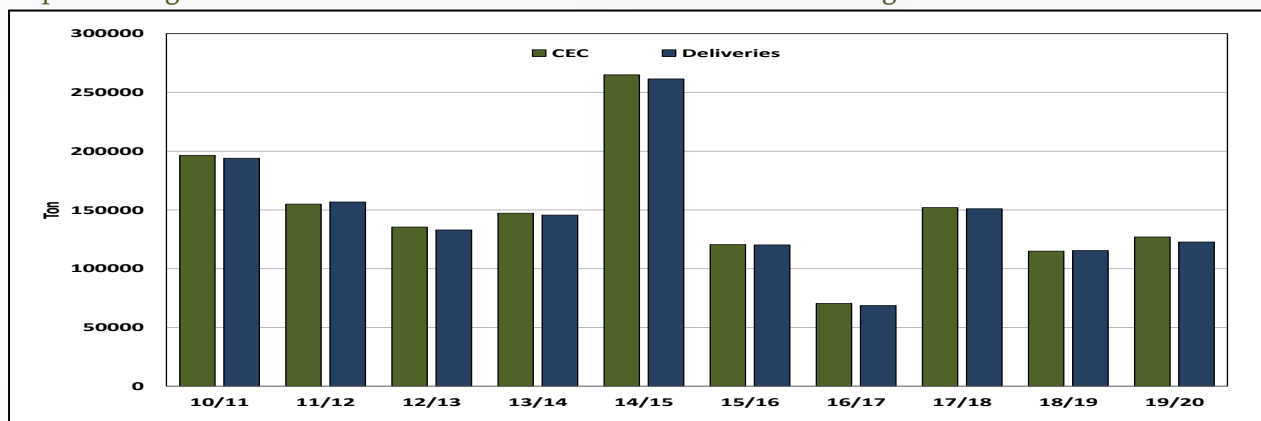
Graph 11: Sorghum supply and demand overview for the current marketing season (Mar 2019 - Feb 2020)



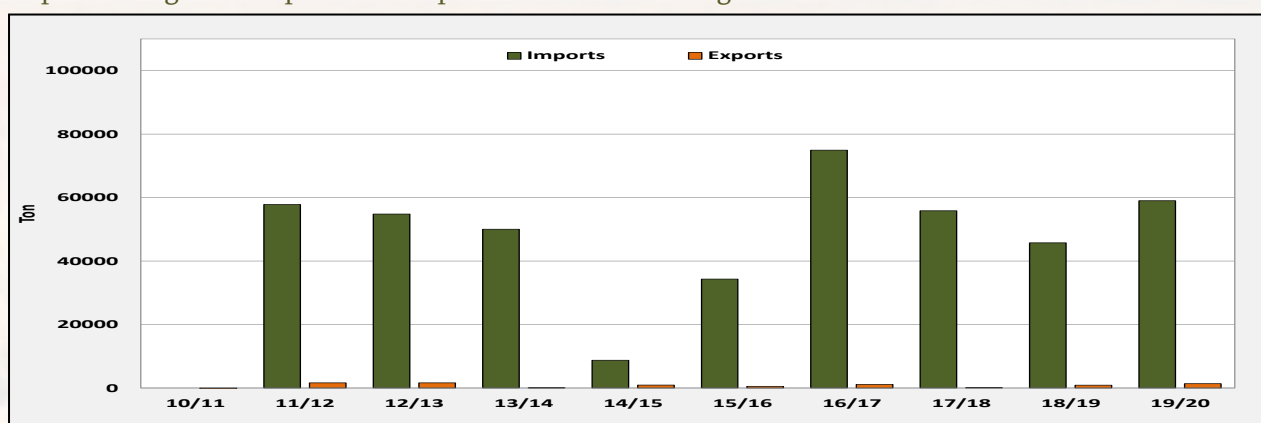
Information provided by SAGIS.

SORGHUM: SUPPLY AND DEMAND TABLE BASED ON SAGIS' INFO (TON)																Publication date: 2020-02-25			
Season (Mar - Feb)																Current Season Mar-Jan			
	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	2009/10-2018/19
CEC (Crop Estimate)	197 300	219 500	373 300	260 000	96 000	176 000	255 000	276 500	196 500	155 000	135 500	147 200	265 000	120 500	70 500	152 000	115 000	127 000	163 370
																		11	
SUPPLY																			
Opening stock (1 Mar)	44 500	56 100	65 500	201 200	204 800	91 000	59 300	87 300	112 400	73 400	62 500	56 015	50 069	121 812	83 142	35 238	59 246	51 860	74 112
Prod deliveries	211 000	219 200	369 700	250 400	100 600	171 900	251 200	275 900	194 000	156 800	133 000	145 604	261 507	120 231	68 578	150 967	115 394	122 753	162 198
Imports	72 200	31 700	5 400	5 000	9 900	31 700	0	4 000	0	57 800	54 800	50 033	8 725	34 316	74 957	55 824	45 739	59 014	38 619
Surplus	0	0	0	0	300	0	1 700	0	2 200	2 800	0	0	0	1 354	0	0	0	0	635
Total Supply	327 700	307 000	440 600	456 600	315 600	294 600	312 200	367 200	308 600	290 800	250 300	251 652	320 301	277 713	226 677	242 029	233 627	233 627	275 565
DEMAND																			
Processed	200 800	179 900	187 800	201 600	189 100	196 200	184 300	192 400	194 300	189 900	165 000	170 536	159 364	159 824	170 315	161 422	154 744	151 252	171 781
-Indoor malting	21 000	21 200	25 200	24 300	25 400	24 900	22 700	20 400	18 000	16 900	13 100	12 093	13 710	11 105	11 706	11 404	9 739	8 644	13 816
-Floor malting	76 400	75 200	77 400	76 900	70 900	64 300	63 600	71 400	66 400	64 400	57 600	56 928	48 504	50 265	51 026	48 709	46 613	46 543	56 185
-Meal, rice & grits	81 300	73 300	75 400	88 300	84 800	95 800	88 800	92 500	101 300	101 400	88 600	96 409	90 346	88 041	97 872	92 719	87 715	87 371	93 690
-Pet Food	1 200	1 300	900	1 300	900	900	900	900	1 100	1 200	800	924	1 113	1 029	1 001	818	850	505	974
-Poultry Feed	14 300	4 900	6 000	7 900	5 800	6 500	5 200	5 300	4 800	5 500	4 300	3 548	3 590	3 948	3 987	4 349	6 600	6 361	4 592
-Livestock feed	6 600	4 000	2 900	2 900	1 300	3 800	3 100	1 900	2 700	500	600	634	2 101	5 436	4 723	3 423	3 227	1 828	2 524
Bio-fuel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Withdrawn by producers	10 500	3 600	6 900	3 700	2 900	4 200	3 800	7 400	7 600	7 800	5 800	5 577	4 683	2 569	644	2 370	1 032	986	4 548
Released to end-consumers	700	1 500	1 400	2 100	2 000	2 300	1 600	4 400	5 300	4 200	2 600	2 707	2 363	2 608	1 209	1 482	766	555	2 764
Net receipts(-)/disp(+)	1 100	1 600	3 600	3 700	3 400	1 900	1 800	-1 100	-300	1 600	1 600	70	932	531	1 101	94	883	1 340	541
Deficit	-4 600	4 500	2 400	800	0	1 600	0	100	0	0	300	3 143	4 978	0	5 521	3 816	1 612	222	1 947
Exports	63 100	50 400	37 300	39 900	27 200	29 100	33 400	51 600	28 300	24 800	19 000	19 550	26 169	29 039	12 649	13 599	9 482	6 886	23 419
Total Demand	271 600	241 500	239 400	251 800	224 600	235 300	224 900	254 800	235 200	228 300	194 300	201 583	198 489	194 571	191 439	182 783	168 519	161 241	204 998
Ending Stock (28 Feb)	56 100	65 500	201 200	204 800	91 000	59 300	87 300	112 400	73 400	62 500	56 000	50 069	121 812	83 142	35 238	59 246	51 860	72 386	70 567
- processed p/month	16 733	14 992	15 650	16 800	15 758	16 350	15 358	16 033	16 192	15 825	13 750	14 211	13 280	13 319	14 193	13 452	12 895	13 750	14 315
- months' stock	3.4	4.4	12.9	12.2	5.8	3.6	5.7	7.0	4.5	3.9	4.1	3.5	9.2	6.2	2.5	4.4	4.0	5.3	5

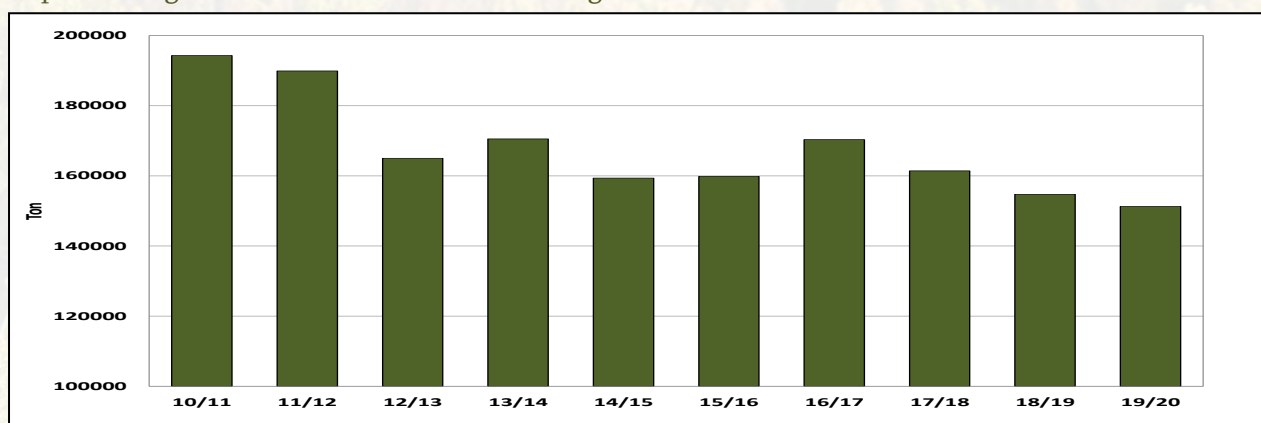
Graph 12: Sorghum: CEC Estimate vs SAGIS deliveries over 10 marketing seasons



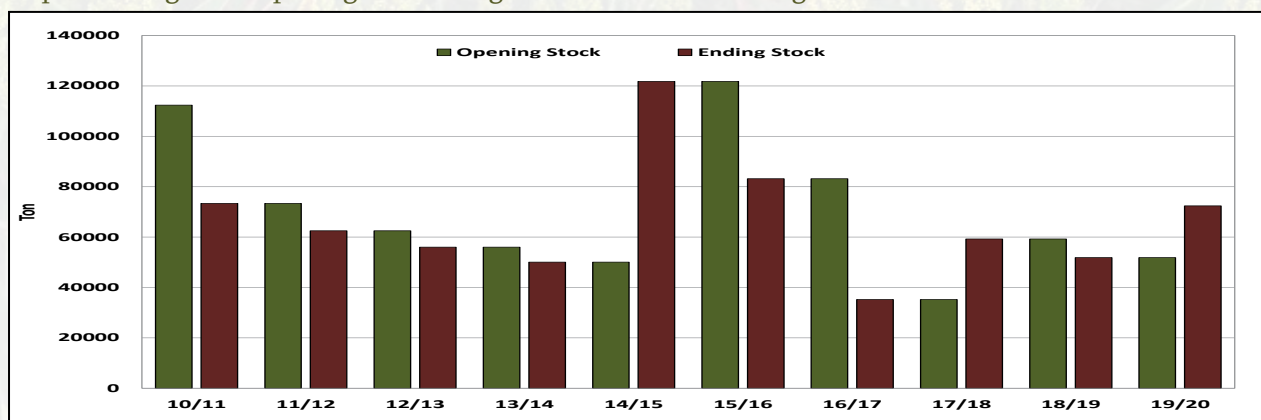
Graph 13: Sorghum: Imports and Exports over 10 marketing seasons



Graph 14: Sorghum: Processed over 10 marketing seasons



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



Information provided by SAGIS.

Season	WHOLE SORGHUM: IMPORTS FOR RSA PER COUNTRY (Tons)							
	Botswana	Brazil	Lesotho	Malawi	Ukraine	United States	Zimbabwe	Total
2015/16	0	27 200	0	0	0	7 116	0	34 316
2016/17	0	0	0	0	280	74 677	0	74 957
2017/18	0	0	6	0	20	55 798	0	55 824
2018/19	2 059	0	0	132	187	24 724	701	27 803
2019/20	1 926	0	0	0	470	55 820	798	59 014

Season	SORGHUM: IMPORTS PER HARBOUR (Tons)					
	Harbours					
	East London	Durban	Cape Town	Port Elizabeth	Richards Bay	Total
2006/07	29 216	30 971	0	0	0	60 187
2007/08	0	59 192	0	0	0	59 192
2008/09	0	34 633	0	0	0	34 633
2009/10	0	34 082	0	0	0	34 082
2010/11	0	28 837	0	0	0	28 837
2011/12	0	74 514	0	0	0	74 514
2012/13	0	140 227	0	0	0	140 227
2013/14	0	76 278	0	0	0	76 278
2014/15	0	17 292	0	0	0	17 292
2015/16	0	65 143	0	0	0	65 143
2016/17	230	142 629	50	0	0	142 909
2017/18	0	68 689	20	0	0	68 709
2018/19	138	47 521	49	0	0	47 708
2019/20*	368	71 839	102	0	0	72 309

* Progressive March 2019 - January 2020

Note: Includes Imports for RSA and Other Countries

Season	WHOLE SORGHUM: RSA EXPORTS PER COUNTRY (Tons)						
	Botswana	Chad	Namibia	Eswatini (Swaziland)	Tanzania	Zambia	Total
2015/16	21 209	0	68	3 129	0	0	24 406
2016/17	5 425	0	0	2 017	0	0	7 442
2017/18	6 591	0	32	1 731	912	200	9 466
2018/19	1 137	0	20	3 641	0	0	4 798
2019/20	388	0	411	3 175	0	0	3 974

Season	SORGHUM: EXPORTS PER HARBOUR (Tons)					
	Harbours					
	East London	Durban	Cape Town	Port Elizabeth	Richards Bay	Total
2006/07	0	2 005	0	0	0	2 005
2007/08	0	0	0	0	0	0
2008/09	0	0	0	0	0	0
2009/10	0	7 911	0	0	0	7 911
2010/11	0	5 072	0	0	0	5 072
2011/12	0	23 087	0	0	0	23 087
2012/13	0	23 706	0	0	0	23 706
2013/14	0	19 250	0	0	0	19 250
2014/15	0	25	0	0	0	25
2015/16	0	5 300	0	0	0	5 300
2016/17	0	35 034	0	0	0	35 034
2017/18	0	6 502	0	0	0	6 502
2018/19	0	6 944	0	0	0	6 944
2019/20*	0	0	0	0	0	0

* Progressive March 2019 - January 2020

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.

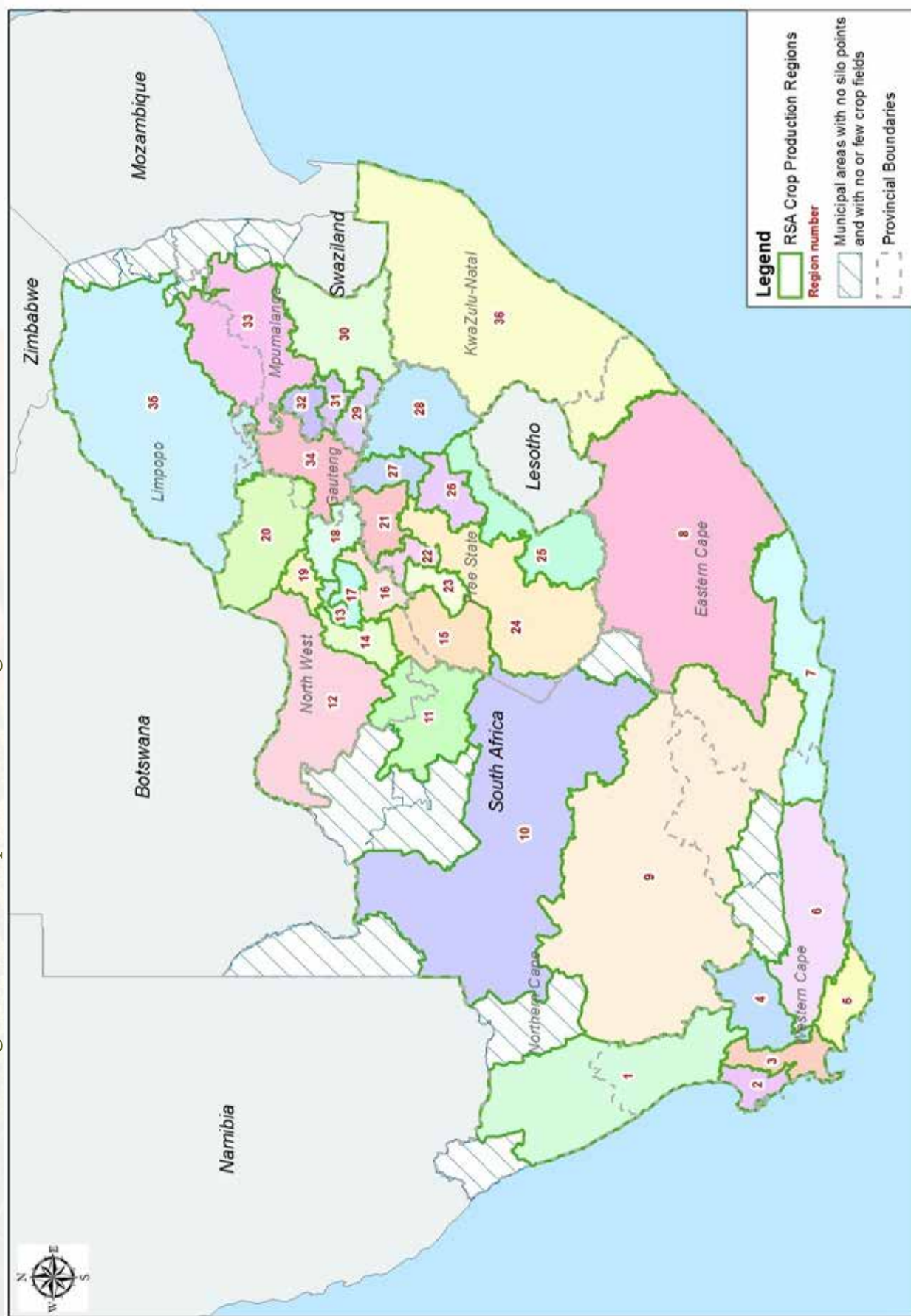
The regions are distributed as follows:

- 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 sorghum samples have been received for the crop quality survey of the 2018/19 production season, are named and described on pages 18 to 19. 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



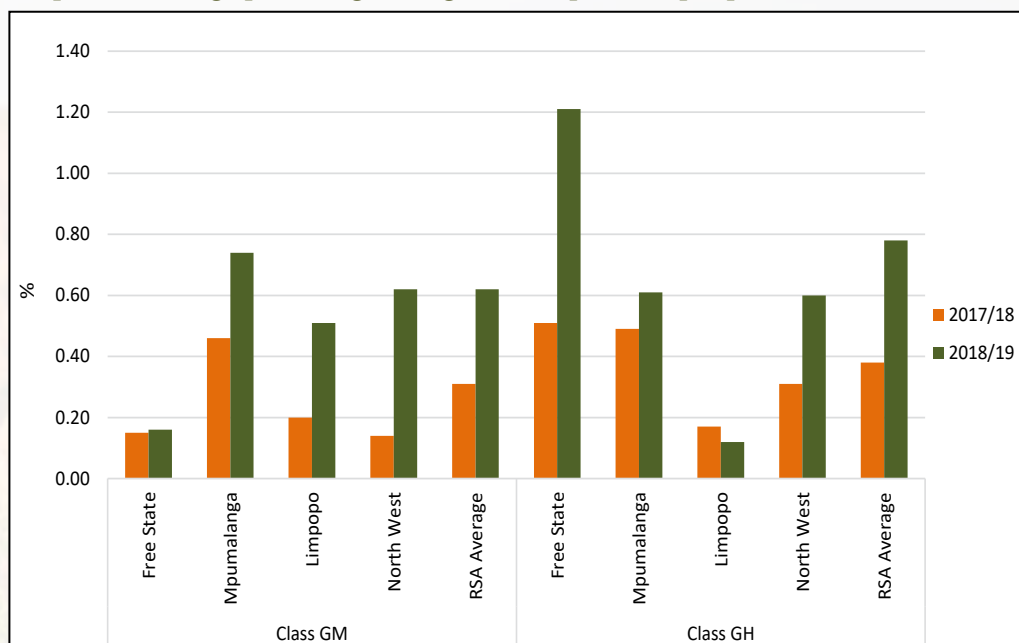
Regional map with gratitude to Agbiz Grain and SIQ.

Sorghum Crop Quality 2018/19– Summary of results

Sixty-five percent (20) of the 31 samples analysed for the purpose of this survey was determined to be class GM. Of these, 18 samples (90%) were graded as Grade GM1. One sample each was graded GM2 and GM3. The remaining 11 samples were all class GH. Ten of these samples were graded GH1 and one was graded GH2.

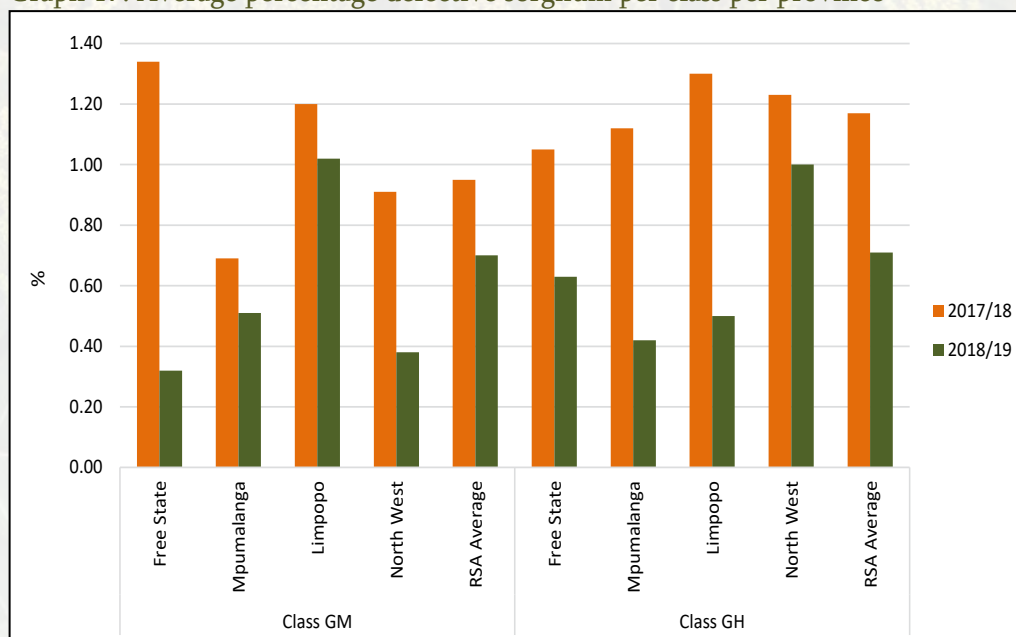
Please see Graphs 16 to 18 for the weighted average percentages foreign matter, defective sorghum and small kernel sorghum per class per province over two seasons. Mpumalanga (10 samples) had the highest percentage foreign matter (0.74%) for GM sorghum, while the Free State (4 samples) showed the highest foreign matter percentage (1.21%) for GH sorghum. The national weighted averages were 0.62% and 0.78% for GM and GH sorghum respectively.

Graph 16: Average percentage foreign matter per class per province

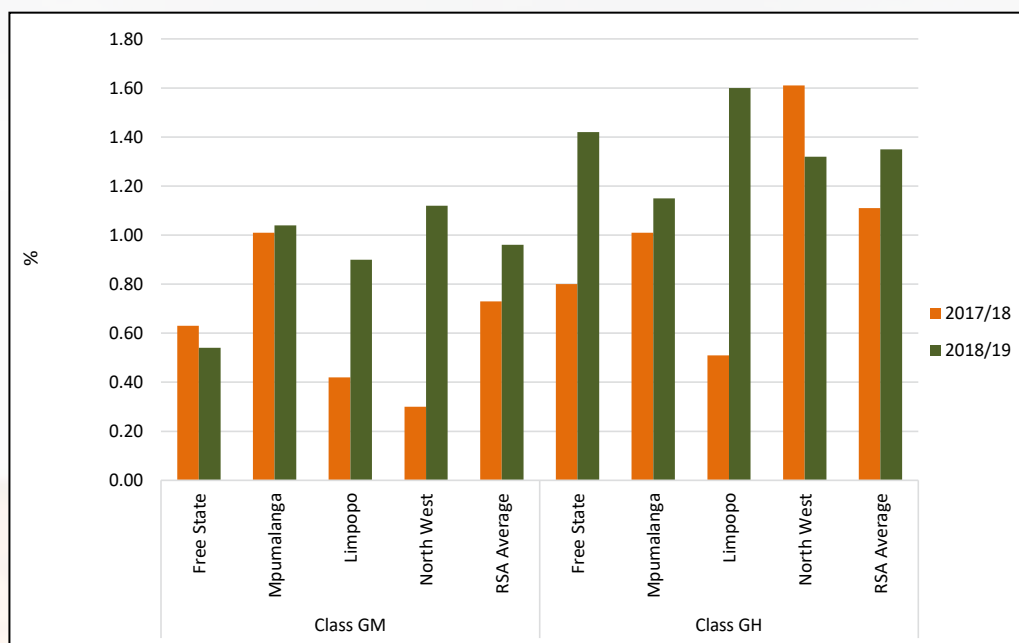


The percentage defective GM sorghum was the highest (1.02%) in the eight samples from Limpopo, North West (4 samples) had the highest percentage defective GH sorghum (1%). The national averages were very similar, 0.70% for GM and 0.71% for GH. As in the previous season, GH sorghum showed the highest percentages small kernels (national average 1.35%), with the sample from Limpopo having the highest percentage namely 1.60%. GM sorghum had the lowest percentage small kernels in the Free State (0.54%) and averaged 0.96%.

Graph 17: Average percentage defective sorghum per class per province

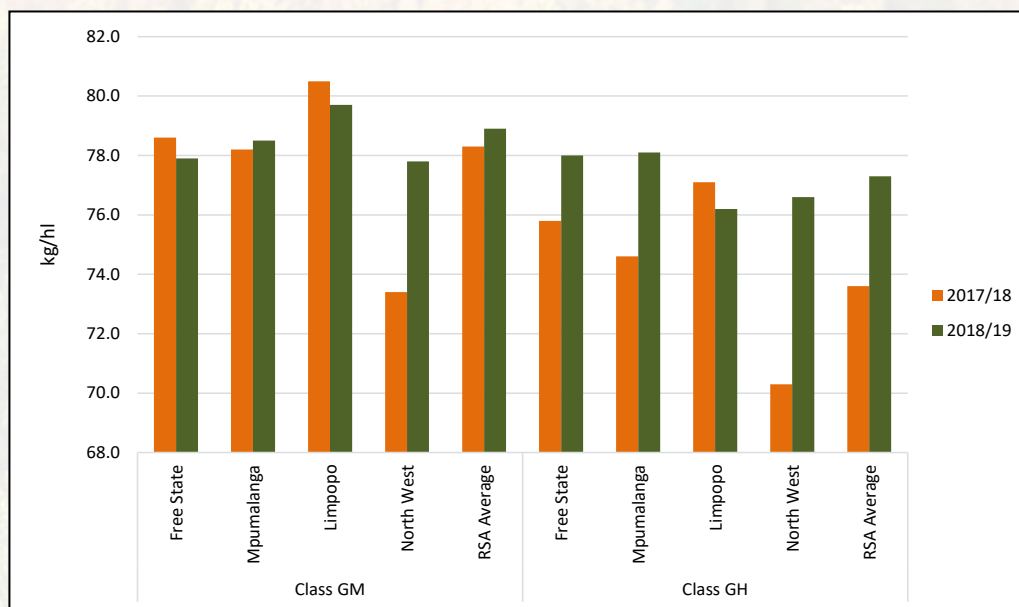


Graph 18: Average percentage small kernel sorghum per class per province



GM sorghum had the highest weighted average test weight, namely 78.9 kg/hl, while GH sorghum averaged 77.3 kg/hl. Please refer to Graph 19. Test weight values for GM sorghum ranged between 74.0 and 81.2 kg/hl, GH values varied from 76.2 kg/hl to 78.9 kg/hl. Test weight was determined on unscreened samples.

Graph 19: Average test weight per class per province

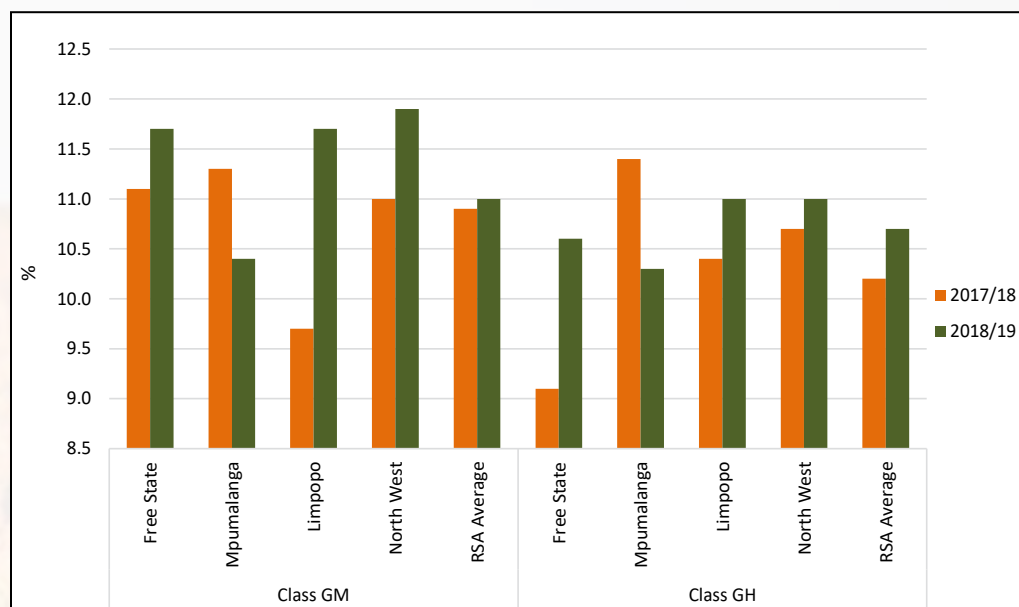


GM sorghum also had the highest 1 000 kernel mass values, ranging between 19.4 and 30.0 g (14% moisture basis) and averaging 25.5 g. GH sorghum averaged 24.4 g and varied between 19.8 and 29.4 g.

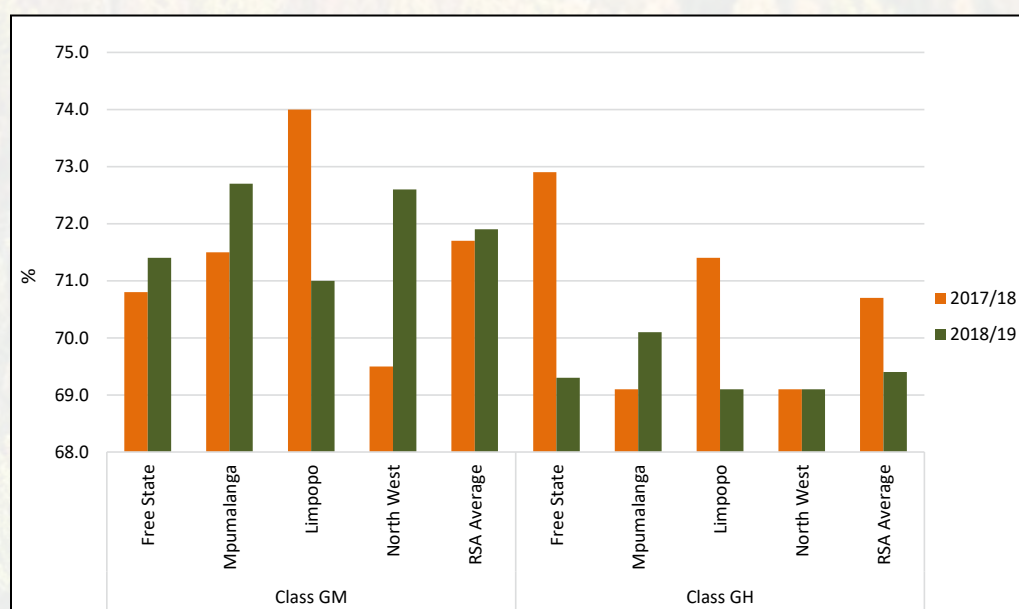
The image analysis results showed that the GM sorghum on average had longer and slightly wider kernels than the GH sorghum. The variation (indicated by the standard deviation) in these parameters is similar for both GM and GH sorghum. Kernel roundness, defined as W/L% (width divided by length, expressed as a percentage) showed a wider variation as can be expected, with a standard deviation of 4.6% for GM and 4.9% for GH sorghum. A totally round kernel will have a W/L% of 100.

The crude protein and total starch contents of the samples were calculated and reported on a dry basis. North West had the highest protein average of 11.9% for GM sorghum, while Mpumalanga averaged the lowest with 10.4%. North West and Limpopo both averaged the highest (11.0%) for GH sorghum, Mpumalanga averaged the lowest at 10.3%. Nationally, GM and GH sorghum averaged 11.0% and 10.7% respectively. The highest total starch content for GM sorghum was reported in Mpumalanga (72.7%), followed closely by North West with 72.6%. Mpumalanga also reported the highest total starch content for GH sorghum, namely 70.1%. The weighted total starch content of GM sorghum was 71.9% and that of GH sorghum 69.4%. Please see Graphs 20 and 21.

Graph 20: Average percentage crude protein per class per province



Graph 21: Average percentage total starch per class per province



Hunterlab colour determinations were done on a milled fraction of dehulled sample above the 1.8 mm slotted sieve. Please see a summary of the Hunter L a b values obtained below, the average and range (in brackets) are provided. For comparison purposes the values obtained in the 2017/18 season indicated in *italics* are also included.

GM sorghum: L 73.48 (69.86 – 76.27), a 4.51 (3.86 – 5.47) and b 10.53 (9.73 – 11.65)

GH sorghum: L 68.88 (67.28 – 69.89), a 4.76 (4.04 – 5.97) and b 9.57 (7.63 – 10.20)

GM sorghum: L 73.81 (67.49 – 83.08), a 4.43 (1.68 – 5.62) and b 10.17 (8.00 – 11.52)

GH sorghum: L 70.00 (66.17 – 73.93), a 4.71 (3.78 – 5.47) and b 9.16 (7.91 – 10.49)

Although there are currently no acceptable ranges for these parameters defined, the colour must be within the consumer-acceptable range, which traditionally are products with a slightly pink hue. Not only the dehulling process, but also other traits such as pigmentation differences determines the end product colour.

Mycotoxin analyses were performed on all 31 sorghum crop samples. The samples were tested by means of a SANAS ISO/IEC 17025 accredited multi-mycotoxin screening method using UPLC-MS/MS. With this technique simultaneous quantification and confirmation of Aflatoxin B₁; B₂; G₁; G₂, Fumonisin B₁; B₂; B₃, Deoxynivalenol, 15-ADON, HT-2 Toxin, T-2 Toxin, Zearalenone and Ochratoxin A is possible in one run.

The average Fumonisin level (Sum of B₁, B₂ and B₃) on all 31 samples tested, was below the limit of quantitation (LOQ = 20 µg/kg) and ranged from not detected (ND) to 213 µg/kg. Of the 31 samples tested, 4 samples (13%) tested positive for fumonisins and the average of these positive results was 98 µg/kg.

The highest Deoxynivalenol (DON) level detected was 199 µg/kg. The average level of all samples tested this season was below the limit of detection (<LOD = ND). 13% of the samples tested positive for DON and the average of these positive results was 147 µg/kg.

Zearalenone residues were found in two (6%) of the samples, with values of 55 µg/kg and 78 µg/kg each. The average of these positive samples was 67 µg/kg.

Mycotoxin levels lower than the limit of quantitation (<LOQ) as well as limit of detection (<LOD) were seen as having tested negative for calculation purposes.

Last season, none of the samples tested positive for any of these mycotoxins. Please see mycotoxin results in Table 10 on pages 28 and 29.

The Methods section of this report on pages 32 to 33 provide a description of the procedures and methodologies followed.

Table 3: South African Sorghum Crop Quality Averages 2018/19 season

Class sorghum		GM				GH		
Grade sorghum		GM1	GM2	GM3	Weighted Average	GH1	GH2	Weighted Average
Grading								
Foreign matter, %		0.55	1.80	0.62	0.62	0.60	2.60	0.78
Unthreshed sorghum, %		0.67	0.72	1.08	0.69	0.78	0.48	0.75
Defective sorghum, %		0.72	0.54	0.38	0.70	0.72	0.62	0.71
Small kernel sorghum, %		0.98	0.50	1.12	0.96	1.41	0.72	1.35
Total defective sorghum and small kernel sorghum, %		1.53	1.04	1.50	1.51	2.13	1.34	2.06
Sorghum of another group, %		0.00	0.22	7.80	0.00	0.00	0.18	0.00
White sorghum, %		0.07	0.80	0.00	0.10	0.02	0.00	0.01
Total of sorghum of another group and white sorghum, %		0.14	1.02	7.80	0.57	0.03	0.18	0.05
Weather-stained sorghum, %		0.71	1.10	0.40	0.71	0.31	1.08	0.38
Physical parameters								
Test weight, kg/hl		79.0	78.7	77.8	78.9	77.2	78.7	77.3
1000 Kernel Mass, g (14% moisture base)		25.2	26.7	30.0	25.5	24.1	27.7	24.4
# Image analysis	Length, mm	4.42	4.36	4.29	4.41	4.21	4.16	4.20
	Standard Deviation	0.30	0.26	0.32	0.30	0.28	0.28	0.28
	Width, mm	3.76	3.80	3.82	3.77	3.77	3.75	3.77
	Standard Deviation	0.23	0.22	0.22	0.23	0.22	0.20	0.22
	Roundness, %	85	87	87	85	89	90	89
	Standard Deviation	4.5	4.7	4.9	4.6	4.8	5.3	4.9
	Surface Area, %	70	71	71	70	68	68	68
	Standard Deviation	3.2	2.6	2.4	3.1	3.0	2.6	3.0
Chemical composition								
Moisture, %		11.0	11.5	11.8	11.1	11.6	11.7	11.6
Protein, % (db)		11.1	9.7	11.9	11.0	10.7	10.5	10.7
Starch content, % (db)		71.8	73.5	72.6	71.9	69.6	67.6	69.4
Hunterlab colour (fraction of dehulled sample above the 1.8 mm slotted sieve milled on Retch mill through 0.5 mm sieve)	L	73.49	73.21	73.56	73.48	68.82	69.43	68.88
	a	4.54	4.19	4.44	4.51	4.76	4.75	4.76
	b	10.58	9.98	10.19	10.53	9.56	9.60	9.57
Number of samples		18	1	1	20	10	1	11

Grain Production Regions

Silo/Intake stands per region indicating type of storage structure

Region 13: North West Central Region (Sannieshof)

NWK	Biesiesvlei (Bins)	NWK	Oppaslaagte (Bins)
NWK	Bossies (Bins)	NWK	Sannieshof (Bins)
NWK	Gerdau (Bins)		

Region 16: North West Central-Eastern Region

Senwes	Klerksdorp (Bins)	Suidwes Landbou	Makwassie (Bins)
Senwes	Regina (Bins)	Suidwes Landbou	Strydpoort (Bins)
Suidwes Landbou	Bamboesspruit (Bins)	Suidwes Landbou	Wolmaranstad (Bins)
Suidwes Landbou	Leeudoringstad (Bins)		

Region 17: North West Central-Northern Region (Ottosdal)

NWK	Boschpoort (Bags/Bins/Bulk)	NWK	Vermaas (Bins)
NWK	Kleinarts (Bins)	Senwes	Hartbeesfontein (Bins)
NWK	Ottosdal (Bins)	Senwes	Melliodora (Bins)
NWK	Rostrataville (Bins)	Senwes	Werda (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)		

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 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)



Grain Production Regions (continue)

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 30: Mpumalanga Eastern Region

Afgri	Amersfoort (Bins)	Afgri	Lothair (Bins)
Afgri	Carolina (Bins)	Afgri	Maizefield (Bins)
Afgri	Davel (Bins)	Afgri	Morgenzon (Bins)
Afgri	Eerstelingsfontein (Bunkers)	Afgri	Overvaal (Bins)
Afgri	Ermelo (Bins)	Afgri	Sandspruit (Bunkers)
Afgri	Estancia (Bins)	TWK	Mkondo (Bins)
Afgri	Hendriksvallei (Bunkers)	TWK	Panbult (Bins)

Region 31: Mpumalanga Central Region

Afgri	Bakenlaagte (Bunkers)	Afgri	Leslie (Bins)
Afgri	Bethal (Bins)	Afgri	Palmietfontein (Bunkers)
Afgri	Brakfontein (Bunkers)	Afgri	Trichardt (Bins)
Afgri	Devon (Bins)	Afgri	Vaalkrantz (Bunkers)
Afgri	Kinross (Bins/Bunkers)		

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 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)



TABLE 4: GRADING RESULTS OF SORGHUM ACCORDING TO GRADE (2018/19)

Number of samples	Region	Foreign matter			Unthreshed sorghum			Defective sorghum			Small kernel sorghum			Total of defective sorghum and small kernel sorghum			Sorghum of another group			White sorghum			Total of Sorghum of another group and White Sorghum			Wheather-Stained Sorghum		
		ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.
GRADE: GM1																												
1	Region 28	0.16	-	-	0.24	-	-	0.32	-	-	0.54	-	-	0.86	-	-	0.16	-	-	0.00	-	-	0.16	-	-	1.00	-	-
2	Region 29	0.71	0.12	1.30	0.46	0.22	0.70	0.55	0.30	0.80	1.07	0.68	1.46	1.62	0.98	2.26	0.00	0.09	0.18	0.00	0.00	0.00	0.09	0.00	0.18	1.08	0.90	1.26
1	Region 30	0.72	-	-	0.84	-	-	0.58	-	-	0.88	-	-	1.46	-	-	0.16	-	-	0.00	-	-	0.16	-	-	1.08	-	-
4	Region 31	0.66	0.32	1.08	0.69	0.56	0.84	0.54	0.16	0.88	1.12	0.66	1.50	1.16	0.30	2.38	0.00	0.10	0.24	0.30	0.00	0.80	0.40	0.00	1.04	1.02	0.32	2.10
2	Region 33	0.44	0.26	0.62	0.62	0.56	0.68	0.36	0.18	0.54	1.17	1.14	1.20	1.03	0.74	1.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.47	0.40	0.54
8	Region 35	0.51	0.18	1.00	0.76	0.58	1.12	1.02	0.38	1.98	0.90	0.48	2.66	1.92	1.38	3.04	0.00	0.05	0.24	0.00	0.00	0.00	0.05	0.00	0.24	0.44	0.20	1.02
18	Ave. GM1	0.55	0.12	1.30	0.67	0.22	1.12	0.72	0.16	1.98	0.98	0.48	2.66	1.53	0.30	3.04	0.07	0.00	0.24	0.07	0.00	0.80	0.14	0.00	1.04	0.71	0.20	2.10
GRADE: GM2																												
1	Region 31	1.80	-	-	0.72	-	-	0.54	-	-	0.50	-	-	1.04	-	-	0.22	-	-	0.80	-	-	1.02	-	-	1.10	-	-
1	Ave. GM2	1.80	-	-	0.72	-	-	0.54	-	-	0.50	-	-	1.04	-	-	0.22	-	-	0.80	-	-	1.02	-	-	1.10	-	-
	Min. GM2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Max. GM2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GRADE: GM3																												
1	Region 16	0.62	-	-	1.08	-	-	0.38	-	-	1.12	-	-	1.50	-	-	7.80	-	-	0.00	-	-	7.80	-	-	0.40	-	-
1	Ave. GM3	0.62	-	-	1.08	-	-	0.38	-	-	1.12	-	-	1.50	-	-	7.80	-	-	0.00	-	-	7.80	-	-	0.40	-	-
	Min. GM3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Max. GM3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE 4: GRADING RESULTS OF SORGHUM ACCORDING TO GRADE (2018/19) (continue)

Number of samples	Region	Foreign matter			Unthreshed sorghum			Defective sorghum			Small kernel sorghum			Total of defective sorghum and small kernel sorghum			Sorghum of another group			White sorghum			Total of Sorghum of another group and White Sorghum			Wheather-Stained Sorghum		
		ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.
GRADE: GH1																												
1	Region 13	1.04	-	-	1.98	-	-	0.82	-	-	2.78	-	-	3.60	-	-	0.00	-	-	0.00	-	-	0.00	-	-	0.12	-	-
1	Region 17	0.48	-	-	0.28	-	-	0.70	-	-	0.86	-	-	1.56	-	-	0.00	-	-	0.00	-	-	0.00	-	-	0.10	-	-
1	Region 19	0.76	-	-	0.54	-	-	0.56	-	-	1.20	-	-	1.76	-	-	0.00	-	-	0.00	-	-	0.00	-	-	0.44	-	-
1	Region 20	0.12	-	-	0.60	-	-	1.92	-	-	0.42	-	-	2.34	-	-	0.00	-	-	0.00	-	-	0.00	-	-	0.20	-	-
3	Region 21	0.74	0.30	1.44	0.93	0.60	1.32	0.63	0.46	0.80	1.65	1.16	2.44	2.27	1.80	3.06	0.00	0.05	0.16	0.05	0.00	0.16	0.11	0.00	0.32	0.36	0.32	0.40
2	Region 33	0.61	0.48	0.74	0.68	0.52	0.84	0.42	0.36	0.48	1.15	1.02	1.28	1.57	1.50	1.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.38	0.62	
1	Region 35	0.12	-	-	0.28	-	-	0.50	-	-	1.60	-	-	2.10	-	-	0.00	-	-	0.00	-	-	0.00	-	-	0.16	-	-
10	Ave. GH1	0.60			0.78			0.72			1.41			2.13			0.02			0.02			0.03			0.31		
	Min. GH1	0.12			0.28			0.36			0.42			1.50			0.00			0.00			0.00			0.10		
	Max. GH1	1.44			1.98			1.92			2.78			3.60			0.16			0.16			0.32			0.62		
GRADE: GH2																												
1	Region 26	2.60	-	-	0.48	-	-	0.62	-	-	0.72	-	-	1.34	-	-	0.18	-	-	0.00	-	-	0.18	-	-	1.08	-	-
1	Ave. GH2	2.60			0.48			0.62			0.72			1.34			0.18			0.00			0.18			1.08		
	Min. GH2	-			-			-			-			-			-			-			-			-		
	Max. GH2	-			-			-			-			-			-			-			-			-		
31	Ave. sorghum	0.67			0.71			0.70			1.10			1.70			0.00			0.07			0.38			0.59		
	Min. sorghum	0.12			0.22			0.16			0.42			0.30			0.31			0.00			0.00			0.10		
	Max. sorghum	2.60			1.98			1.98			2.78			3.60			7.80			0.80			7.80			2.10		

TABLE 5: GRADING RESULTS OF SORGHUM ACCORDING TO CLASS (2018/19)

Number of samples	Region	Foreign matter			Unthreshed sorghum			Defective sorghum			Small kernel sorghum			Total of defective sorghum and small kernel sorghum			Sorghum of another group			White sorghum			Total of Sorghum of another group and White Sorghum			Wheather-Stained Sorghum		
		ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.
GRADE: GM																												
1	Region 16	0.62	-	-	1.08	-	-	0.38	-	-	1.12	-	-	1.50	-	-	7.80	-	-	0.00	-	-	7.80	-	-	0.40	-	-
1	Region 28	0.16	-	-	0.24	-	-	0.32	-	-	0.54	-	-	0.86	-	-	0.16	-	-	0.00	-	-	0.16	-	-	1.00	-	-
2	Region 29	0.71	0.12	1.30	0.46	0.22	0.70	0.55	0.30	0.80	1.07	0.68	1.46	1.62	0.98	2.26	0.00	0.09	0.18	0.00	0.00	0.00	0.09	0.00	0.18	1.08	0.90	1.26
1	Region 30	0.72	-	-	0.84	-	-	0.58	-	-	0.88	-	-	1.46	-	-	0.16	-	-	0.00	-	-	0.16	-	-	1.08	-	-
5	Region 31	0.88	0.32	1.80	0.69	0.56	0.84	0.54	0.16	0.88	1.00	0.50	1.50	1.13	0.30	2.38	0.00	0.12	0.24	0.40	0.00	0.80	0.52	0.00	1.04	1.03	0.32	2.10
2	Region 33	0.44	0.26	0.62	0.62	0.56	0.68	0.36	0.18	0.54	1.17	1.14	1.20	1.03	0.74	1.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.47	0.40	0.54
8	Region 35	0.51	0.18	1.00	0.76	0.58	1.12	1.02	0.38	1.98	0.90	0.48	2.66	1.92	1.38	3.04	0.00	0.05	0.24	0.00	0.00	0.00	0.05	0.00	0.24	0.44	0.20	1.02
20	Ave. GM	0.62	0.12	1.80	0.69	0.22	1.12	0.70	0.16	1.98	0.96	0.48	2.66	1.51	0.30	3.04	0.47	0.00	7.80	0.10	0.00	0.80	0.57	0.00	7.80	0.71	0.20	2.10
	Min. GM																											
	Max. GM																											
GRADE: GH																												
1	Region 13	1.04	-	-	1.98	-	-	0.82	-	-	2.78	-	-	3.60	-	-	0.00	-	-	0.00	-	-	0.00	-	-	0.12	-	-
1	Region 17	0.48	-	-	0.28	-	-	0.70	-	-	0.86	-	-	1.56	-	-	0.00	-	-	0.00	-	-	0.00	-	-	0.10	-	-
1	Region 19	0.76	-	-	0.54	-	-	0.56	-	-	1.20	-	-	1.76	-	-	0.00	-	-	0.00	-	-	0.00	-	-	0.44	-	-
1	Region 20	0.12	-	-	0.60	-	-	1.92	-	-	0.42	-	-	2.34	-	-	0.00	-	-	0.00	-	-	0.00	-	-	0.20	-	-
3	Region 21	0.74	0.30	1.44	0.93	0.60	1.32	0.63	0.46	0.80	1.65	1.16	2.44	2.27	1.80	3.06	0.00	0.05	0.16	0.05	0.00	0.16	0.11	0.00	0.32	0.36	0.32	0.40
1	Region 26	2.60	-	-	0.48	-	-	0.62	-	-	0.72	-	-	1.34	-	-	0.18	-	-	0.00	-	-	0.18	-	-	1.08	-	-
2	Region 33	0.61	0.48	0.74	0.68	0.52	0.84	0.42	0.36	0.48	1.15	1.02	1.28	1.57	1.50	1.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.38	0.62	
1	Region 35	0.12	-	-	0.28	-	-	0.50	-	-	1.60	-	-	2.10	-	-	0.00	-	-	0.00	-	-	0.00	-	-	0.16	-	-
11	Ave. GH	0.78	0.12	2.60	0.75	0.28	1.98	0.71	0.36	1.92	1.35	0.42	2.78	2.06	1.34	3.60	0.03	0.00	0.18	0.01	0.00	0.16	0.05	0.00	0.32	0.38	0.10	1.08
	Min. GH																											
	Max. GH																											

TABLE 6: PHYSICAL PARAMETERS & IMAGE ANALYSIS OF SORGHUM ACCORDING TO GRADE (2018/19)

Number of samples	Region	Test weight, kg/hl			1000 Kernel mass, g			Image Analysis Length (mm) Average			Image Analysis Length (mm) Std Dev			Width (mm) Average			Width (mm) Std Dev			Relative Roundness (%) Average			Relative Roundness (%) Std Dev			Volume to surface ratio (%) Average			Volume to surface ratio (%) Std Dev		
		ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.			
GRADE: GM1																															
1	Region 28	77.9	-	-	29.1	-	-	4.38	-	-	0.28	-	-	3.78	-	-	0.19	-	-	85	-	-	4.8	-	-	71	-	-	2.4	-	-
2	Region 29	80.7	80.5	80.9	24.0	23.8	24.2	4.42	4.23	4.61	0.32	0.30	0.35	3.94	3.81	4.07	0.30	0.28	0.33	89	88	90	4.9	4.8	5.1	71	69	74	4.5	3.9	5.1
1	Region 30	80.3	-	-	23.5	-	-	4.33	-	-	0.38	-	-	3.93	-	-	0.39	-	-	91	-	-	4.9	-	-	71	-	-	5.0	-	-
4	Region 31	76.5	74.0	78.3	26.6	25.7	27.1	4.33	4.26	4.39	0.31	0.29	0.34	3.76	3.74	3.79	0.22	0.18	0.27	87	84	90	4.8	3.7	5.8	69	66	71	3.1	2.7	3.4
2	Region 33	79.3	77.7	80.9	24.9	23.7	26.0	4.15	4.07	4.23	0.25	0.23	0.27	3.83	3.73	3.92	0.21	0.18	0.23	92	92	93	4.1	3.8	4.5	67	64	70	3.0	2.6	3.3
8	Region 35	79.7	77.8	81.2	24.5	19.4	29.6	4.56	4.45	4.68	0.29	0.25	0.33	3.68	3.58	3.83	0.21	0.20	0.23	80	78	83	4.3	3.7	4.7	72	70	73	2.8	2.2	3.3
18	Ave. GM1	79.0			25.2			4.42			0.30			3.76			0.23			85			4.5			70			3.2		
	Min. GM1	74.0			19.4			4.07			0.23			3.58			0.18			78			3.7			64			2.2		
	Max. GM1	81.2			29.6			4.68			0.38			4.07			0.39			93			5.8			74			5.1		
GRADE: GM2																															
1	Region 31	78.7	-	-	26.7	-	-	4.36	-	-	0.26	-	-	3.80	-	-	0.22	-	-	87	-	-	4.7	-	-	71	-	-	2.6	-	-
1	Ave. GM2	78.7			26.7			4.36			0.26			3.80			0.22			87			4.7			71			2.6		
	Min. GM2	-			-			-			-			-			-			-			-			-			-		
	Max. GM2	-			-			-			-			-			-			-			-			-			-		
GRADE: GM3																															
1	Region 16	77.8	-	-	30.0	-	-	4.29	-	-	0.32	-	-	3.82	-	-	0.22	-	-	87	-	-	4.9	-	-	71	-	-	2.4	-	-
1	Ave. GM3	77.8			30.0			4.29			0.32			3.82			0.22			87			4.9			71			2.4		
	Min. GM3	-			-			-			-			-			-			-			-			-			-		
	Max. GM3	-			-			-			-			-			-			-			-			-			-		

TABLE 6: PHYSICAL PARAMETERS & IMAGE ANALYSIS OF SORGHUM ACCORDING TO GRADE (2018/19)
(continue)

Number of samples	Region	Test weight, kg/hl		1000 Kernel mass, g		Image Analysis Length (mm) Average		Image Analysis Length (mm) Std Dev		Width (mm) Average		Width (mm) Std Dev		Relative Roundness (%) Average		Relative Roundness (%) Std Dev		Volume to surface ratio (%) Average		Volume to surface ratio (%) Std Dev		
		ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.
GRADE: GH1																						
1	Region 13	77.2	-	-	21.3	-	-	4.30	-	-	3.70	-	-	0.19	-	-	4.6	-	-	70	-	-
1	Region 17	76.6	-	-	25.1	-	-	4.36	-	-	3.82	-	-	0.20	-	-	5.4	-	-	70	-	-
1	Region 19	76.2	-	-	19.8	-	-	4.08	-	-	3.74	-	-	0.21	-	-	4.8	-	-	68	-	-
1	Region 20	76.5	-	-	26.3	-	-	4.27	-	-	3.80	-	-	0.18	-	-	4.8	-	-	70	-	-
3	Region 21	77.7	76.5	78.7	23.9	22.3	25.4	4.12	4.04	4.18	3.66	3.60	3.70	0.22	0.21	0.23	5.5	4.7	6.7	66	65	67
2	Region 33	78.1	77.2	78.9	23.7	23.6	23.8	4.21	4.17	4.25	3.91	3.83	4.00	0.28	0.26	0.31	3.7	3.2	4.3	69	67	71
1	Region 35	76.2	-	-	29.4	-	-	4.26	-	-	3.82	-	-	0.21	-	-	4.7	-	-	70	-	-
10	Ave. GH1	77.2			24.1			4.21			3.77			0.22			4.8			68		
	Min. GH1	76.2			19.8			4.04			3.60			0.18			3.2			65		
	Max. GH1	78.9			29.4			4.36			4.00			0.31			6.7			71		
GRADE: GH2																						
1	Region 26	78.7	-	-	27.7	-	-	4.16	-	-	3.75	-	-	0.20	-	-	5.3	-	-	68	-	-
1	Ave. GH2	78.7			27.7			4.16			3.75			0.20			5.3			68		
	Min. GH2	-			-			-			-			-			-			-		
	Max. GH2	-			-			-			-			-			-			-		
31	Ave. sorghum	78.4			25.1			4.34			3.77			0.23			4.7			70		
	Min. sorghum	74.0			19.4			4.04			3.58			0.18			3.2			64		
	Max. sorghum	81.2			30.0			4.68			4.07			0.39			6.7			74		
																				2.2		5.1

**TABLE 8: CHEMICAL COMPOSITION OF SORGHUM ACCORDING TO GRADE
(2018/19)**

Number of samples	Region	Moisture, %			Protein, % (db)			Starch content, % (db)			Hunterlab Colour								
											L			a			b		
		ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.			
GRADE: GM1																			
1	Region 28	11.4	-	-	11.7	-	-	71.4	-	-	71.29	-	-	4.93	-	-	10.26	-	-
2	Region 29	10.3	10.2	10.4	11.1	10.3	11.9	72.3	72.1	72.5	73.54	73.17	73.91	4.80	4.59	5.01	10.30	10.30	10.30
1	Region 30	10.5	-	-	11.4	-	-	72.2	-	-	73.28	-	-	4.66	-	-	10.30	-	-
4	Region 31	11.5	11.5	11.5	10.0	9.6	10.5	72.3	70.2	74.4	72.02	69.86	73.21	4.61	4.27	5.28	10.02	9.80	10.40
2	Region 33	11.0	10.6	11.4	10.0	9.5	10.5	73.6	73.4	73.7	71.66	70.44	72.88	5.02	4.57	5.47	9.86	9.73	9.98
8	Region 35	11.0	10.3	11.5	11.7	10.0	12.6	71.0	70.4	72.9	74.98	74.14	76.27	4.25	3.86	4.55	11.18	10.71	11.65
18	Ave. GM1	11.0			11.1			71.8			73.49			4.54			10.58		
	Min. GM1		10.2			9.5			70.2			69.86			3.86			9.73	
	Max. GM1			11.5			12.6			74.4			76.27			5.47			11.65
GRADE: GM2																			
1	Region 31	11.5	-	-	9.7	-	-	73.5	-	-	73.21	-	-	4.19	-	-	9.98	-	-
1	Ave. GM2	11.5			9.7			73.5			73.21			4.19			9.98		
	Min. GM2		-			-			-			-			-			-	
	Max. GM2			-			-		-			-			-			-	
GRADE: GM3																			
1	Region 16	11.8	-	-	11.9	-	-	72.6	-	-	73.56	-	-	4.44	-	-	10.19	-	-
1	Ave. GM3	11.8			11.9			72.6			73.56			4.44			10.19		
	Min. GM3		-			-			-			-			-			-	
	Max. GM3			-			-		-			-			-			-	
GRADE: GH1																			
1	Region 13	12.3	-	-	11.2	-	-	68.0	-	-	67.28	-	-	4.16	-	-	10.02	-	-
1	Region 17	10.9	-	-	13.1	-	-	68.2	-	-	69.89	-	-	4.37	-	-	10.20	-	-
1	Region 19	11.1	-	-	10.8	-	-	68.7	-	-	69.73	-	-	4.04	-	-	7.63	-	-
1	Region 20	11.8	-	-	8.9	-	-	71.6	-	-	68.65	-	-	5.00	-	-	9.30	-	-
3	Region 21	12.0	11.8	12.1	10.6	8.4	11.9	69.9	68.1	73.3	69.58	69.39	69.71	4.56	4.49	4.61	9.50	8.96	9.78
2	Region 33	11.1	11.1	11.1	10.3	9.4	11.2	70.1	69.3	70.9	68.06	67.73	68.38	5.45	4.93	5.97	10.11	10.07	10.15
1	Region 35	11.6	-	-	11.0	-	-	69.1	-	-	67.81	-	-	5.44	-	-	9.76	-	-
10	Ave. GH1	11.6			10.7			69.6			68.82			4.76			9.56		
	Min. GH1		10.9			8.4			68.0			67.28			4.04			7.63	
	Max. GH1			12.3			13.1			73.3			69.89			5.97			10.20
GRADE: GH2																			
1	Region 26	11.7	-	-	10.5	-	-	67.6	-	-	69.43	-	-	4.75	-	-	9.60	-	-
1	Ave. GH2	11.7			10.5			67.6			69.43			4.75			9.60		
	Min. GH2		-			-			-			-			-			-	
	Max. GH2			-			-		-			-			-			-	
31	Ave. sorghum	11.3			10.9			71.0			71.85			4.60			10.19		
	Min. sorghum		10.2			8.4			67.6			67.28			3.86			7.63	
	Max. sorghum			12.3			13.1			74.4			76.27			5.97			11.65

**TABLE 9: CHEMICAL COMPOSITION OF SORGHUM ACCORDING TO CLASS
(2018/19)**

Number of samples	Region	Moisture, %			Protein, % (db)			Starch content, % (db)			Hunterlab Colour								
											L			a			b		
		ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.	ave.	min.	max.			
GRADE: GM																			
1	Region 16	11.8	-	-	11.9	-	-	72.6	-	-	73.56	-	-	4.44	-	-	10.19	-	-
1	Region 28	11.4	-	-	11.7	-	-	71.4	-	-	71.29	-	-	4.93	-	-	10.26	-	-
2	Region 29	10.3	10.2	10.4	11.1	10.3	11.9	72.3	72.1	72.5	73.54	73.17	73.91	4.80	4.59	5.01	10.30	10.30	10.30
1	Region 30	10.5	-	-	11.4	-	-	72.2	-	-	73.28	-	-	4.66	-	-	10.30	-	-
5	Region 31	11.5	11.5	11.5	10.0	9.6	10.5	72.5	70.2	74.4	72.26	69.86	73.21	4.52	4.19	5.28	10.01	9.80	10.40
2	Region 33	11.0	10.6	11.4	10.0	9.5	10.5	73.6	73.4	73.7	71.66	70.44	72.88	5.02	4.57	5.47	9.86	9.73	9.98
8	Region 35	11.0	10.3	11.5	11.7	10.0	12.6	71.0	70.4	72.9	74.98	74.14	76.27	4.25	3.86	4.55	11.18	10.71	11.65
20	Ave. GM	11.1			11.0			71.9			73.48			4.51			10.53		
	Min. GM	10.2			9.5			70.2			69.86			3.86			9.73		
	Max. GM	11.8			12.6			74.4			76.27			5.47			11.65		
GRADE: GH																			
1	Region 13	12.3	-	-	11.2	-	-	68.0	-	-	67.28	-	-	4.16	-	-	10.02	-	-
1	Region 17	10.9	-	-	13.1	-	-	68.2	-	-	69.89	-	-	4.37	-	-	10.20	-	-
1	Region 19	11.1	-	-	10.8	-	-	68.7	-	-	69.73	-	-	4.04	-	-	7.63	-	-
1	Region 20	11.8	-	-	8.9	-	-	71.6	-	-	68.65	-	-	5.00	-	-	9.30	-	-
3	Region 21	12.0	11.8	12.1	10.6	8.4	11.9	69.9	68.1	73.3	69.58	69.39	69.71	4.56	4.49	4.61	9.50	8.96	9.78
1	Region 26	11.7	-	-	10.5	-	-	67.6	-	-	69.43	-	-	4.75	-	-	9.60	-	-
2	Region 33	11.1	11.1	11.1	10.3	9.4	11.2	70.1	69.3	70.9	68.06	67.73	68.38	5.45	4.93	5.97	10.11	10.07	10.15
1	Region 35	11.6	-	-	11.0	-	-	69.1	-	-	67.81	-	-	5.44	-	-	9.76	-	-
11	Ave. GH	11.6			10.7			69.4			68.88			4.76			9.57		
	Min. GH	10.9			8.4			67.6			67.28			4.04			7.63		
	Max. GH	12.3			13.1			73.3			69.89			5.97			10.20		

TABLE 10: MYCOTOXIN RESULTS - SORGHUM CROP QUALITY 2018/19

Region	Grade	Aflatoxin µg/kg					Fumonisin µg/kg				DON µg/kg		15-ADON µg/kg	Ochratoxin A µg/kg	Zearalenone µg/kg	HT-2 µg/kg	T-2 µg/kg
		B ₁ LOQ: 5 µg/kg	B ₂ LOQ: 5 µg/kg	G ₁ LOQ: 5 µg/kg	G ₂ LOQ: 5 µg/kg	Total	B ₁ LOQ: 20 µg/kg	B ₂ LOQ: 20 µg/kg	B ₃ LOQ: 20 µg/kg	Total	LOQ: 100 µg/kg	LOQ: 100 µg/kg	LOQ: 5 µg/kg	LOQ: 20 µg/kg	LOD: 20 µg/kg	LOQ: 20 µg/kg	
13	GH1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
16	GM3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
17	GH1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
19	GH1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
20	GH1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
21	GH1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
21	GH1	ND	ND	ND	ND	ND	ND	ND	ND	ND	<100	ND	ND	ND	ND	ND	ND
21	GH1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
26	GH2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
28	GM1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
29	GM1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
29	GM1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
30	GM1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
31	GM1	ND	ND	ND	ND	ND	ND	ND	ND	ND	199	ND	ND	ND	<20	ND	ND
31	GM1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
31	GM1	ND	ND	ND	ND	ND	ND	ND	ND	ND	111	ND	ND	ND	55	ND	ND
31	GM2	ND	ND	ND	ND	ND	ND	ND	ND	ND	127	ND	ND	ND	78	ND	ND
31	GM1	ND	ND	ND	ND	ND	ND	ND	ND	ND	152	ND	ND	ND	<20	ND	ND
33	GH1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
33	GH1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
33	GM1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
33	GM1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
35	GM1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
35	GM1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
35	GH1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 10: MYCOTOXIN RESULTS - SORGHUM CROP QUALITY 2018/19 (continue)

Region	Grade	Aflatoxin µg/kg				Fumonisin µg/kg				DON µg/kg LOQ: 100 µg/kg	15-ADON µg/kg LOQ: 100 µg/kg	Ochratoxin A µg/kg LOQ: 5 µg/kg	Zearalenone µg/kg LOQ: 20 µg/kg	HT-2 µg/kg LOD: 20 µg/kg	T-2 µg/kg LOQ: 20 µg/kg
		B ₁ LOQ: 5 µg/kg	B ₂ LOQ: 5 µg/kg	G ₁ LOQ: 5 µg/kg	G ₂ LOQ: 5 µg/kg	Total	B ₁ LOQ: 20 µg/kg	B ₂ LOQ: 20 µg/kg	B ₃ LOQ: 20 µg/kg						
35	GM1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
35	GM1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
35	GM1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
35	GM1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
35	GM1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
35	GM1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total number of samples		31	31	31	31	31	31	31	31	31	31	31	31	31	31
Average of total number of samples		0	0	0	0	0	<20	ND	ND	ND	0	0	ND	0	0
Number of positive results		0	0	0	0	0	4	2	1	4	0	0	2	0	0
Average of positive results		0	0	0	0	0	77	28	30	147	0	0	67	0	0
Maximum of positive results		0	0	0	0	0	157	29	30	199	0	0	78	0	0

Note:

Limit of quantitation (LOQ) means the lowest concentration level that can be quantified with acceptable precision and accuracy by the LC-MS/MS.

A concentration measured below the LOQ is reported as <LOQ.

Limit of detection (LOD) is the lowest concentration level that can be detected but not quantified and is 50% of the LOQ of each mycotoxin.

A concentration measured below the LOD is reported as not detected (ND).

Mycotoxin levels above the LOQ were seen as a positive result for calculation purposes.

µg/kg = ppb (parts per billion)

TABLE 11: IMPORTED SORGHUM QUALITY

Quality of sorghum imported from March 2019 to February 2020 compared to RSA crop quality of the 2018/19 season

Country of origin		Argentina		RSA Crop Average	
Class sorghum		GM	Class Other	GM	Class Other
Grade sorghum		GM3	-	GM3	-
Grading					
Foreign matter, %		2.56	7.20	0.62	-
Unthreshed sorghum, %		1.00	0.72	1.08	-
Defective sorghum, %		0.56	0.80	0.38	-
Small kernel sorghum, %		1.28	3.60	1.12	-
Total defective sorghum and small kernel sorghum, %		1.84	4.40	1.50	-
Sorghum of another group, %		0.00	0.00	7.80	-
White sorghum, %		1.52	2.36	0.00	-
Total of sorghum of another group and white sorghum, %		1.52	2.36	7.80	-
Weather-stained sorghum, %		1.48	1.76	0.40	-
Physical parameters					
Test weight, kg/hl		78.5	80.4	77.8	-
1000 Kernel Mass, g (14% moisture base)		23.7	23.1	30.0	-
# Image analysis	Length, mm	4.46	4.50	4.29	-
	Standard Deviation	0.37	0.30	0.32	-
	Width, mm	3.86	3.90	3.82	-
	Standard Deviation	0.31	0.26	0.22	-
	Roundness, %	86	88	87	-
	Standard Deviation	5.0	5.1	4.9	-
	Surface Area, %	72	72	71	-
	Standard Deviation	4.2	3.8	2.4	-
Chemical composition					
Moisture, %		12.0	12.0	11.8	-
Protein, % (db)		10.0	10.1	11.9	-
Starch content, % (db)		75.7	74.6	72.6	-
Hunterlab colour (fraction of dehulled sample above the 1.8 mm slotted sieve milled on Retch mill through 0.5 mm sieve)	L	74.87	75.43	73.56	-
	a	4.11	3.96	4.44	-
	b	11.26	11.13	10.19	-
Mycotoxins (µg/kg)					
Aflatoxin B ₁		ND	ND	ND	-
Aflatoxin B ₂		ND	ND	ND	-
Aflatoxin G ₁		ND	ND	ND	-
Aflatoxin G ₂		ND	ND	ND	-
Total		ND	ND	ND	-
Fumonisin B ₁		ND	ND	ND	-
Fumonisin B ₂		ND	ND	ND	-
Fumonisin B ₃		ND	ND	ND	-
Total		ND	ND	ND	-
Deoxynivalenol		ND	ND	ND	-
15-ADON		ND	ND	ND	-
Ochratoxin A		ND	ND	ND	-
Zearalenone		ND	ND	ND	-
HT2		ND	ND	ND	-
T2		ND	ND	ND	-
Number of samples		1	1	1	1

TABLE 11: IMPORTED SORGHUM QUALITY (continue)

Quality of sorghum imported from March 2019 to February 2020 compared to RSA crop quality of the 2018/19 season

Country of origin		USA		RSA Crop Average	
Class sorghum		GM		GM	
Grade sorghum		GM2	GM3	GM2	GM3
Grading					
Foreign matter, %		1.65	0.99	1.80	0.62
Unthreshed sorghum, %		1.47	0.94	0.72	1.08
Defective sorghum, %		1.25	1.26	0.54	0.38
Small kernel sorghum, %		2.09	2.16	0.50	1.12
Total defective sorghum and small kernel sorghum, %		3.35	3.43	1.04	1.50
Sorghum of another group, %		0.24	0.08	0.22	7.80
White sorghum, %		4.79	6.85	0.80	0.00
Total of sorghum of another group and white sorghum, %		5.03	6.93	1.02	7.80
Weather-stained sorghum, %		2.97	2.71	1.10	0.40
Physical parameters					
Test weight, kg/hl		75.0	76.2	78.7	77.8
1000 Kernel Mass, g (14% moisture base)		24.1	23.9	26.7	30.0
# Image analysis	Length, mm	4.32	4.29	4.36	4.29
	Standard Deviation	0.34	0.34	0.26	0.32
	Width, mm	3.71	3.74	3.80	3.82
	Standard Deviation	0.33	0.30	0.22	0.22
	Roundness, %	86	87	87	87
	Standard Deviation	6.0	5.0	4.7	4.9
	Surface Area, %	68	69	71	71
	Standard Deviation	5.2	3.7	2.6	2.4
Chemical composition					
Moisture, %		12.8	13.8	11.5	11.8
Protein, % (db)		9.7	9.4	9.7	11.9
Starch content, % (db)		74.0	72.9	73.5	72.6
Hunterlab colour (fraction of dehulled sample above the 1.8 mm slotted sieve milled on Retch mill through 0.5 mm sieve)	L	73.58	74.63	73.21	73.56
	a	4.04	3.93	4.19	4.44
	b	10.28	10.23	9.98	10.19
Mycotoxins (µg/kg)					
Aflatoxin B ₁		ND	ND	ND	ND
Aflatoxin B ₂		ND	ND	ND	ND
Aflatoxin G ₁		ND	ND	ND	ND
Aflatoxin G ₂		ND	ND	ND	ND
Total		ND	ND	ND	ND
Fumonisin B ₁		<20 [38]	60 [136]	157	ND
Fumonisin B ₂		ND	ND [35]	26	ND
Fumonisin B ₃		ND	ND [35]	30	ND
Total [max value]		<20 [38]	73 [206]	213	ND
Deoxynivalenol		<100 [178]	<100 [267]	127	ND
15-ADON		ND	ND	ND	ND
Ochratoxin A		ND	ND	ND	ND
Zearalenone		<20 [43]	22 [99]	78	ND
HT2		ND	ND	ND	ND
T2		ND	ND	ND	ND
Number of samples		3	10	1	1

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 Sorghum intended for sale in the Republic of South Africa (Government Notice NO. R. 15 of 08 January 2016).

See pages 38 to 47 of this report.

Test weight

Test weight, providing a measure of the bulk density of grain and oilseeds, was determined according to ISO 7971-3, by means of the Kern 222 instrument.

To calculate the bulk density p , expressed in kilogram per hectolitre (kg/hl), the following equation was applied: $p = 0.1002 m + 0.53$. This is the equation used for wheat, since an equation for sorghum is not available.

The test weight analyses were done on unscreened sorghum samples.

Thousand kernel mass

This is the weight in grams of one thousand kernels of grain and provides a measure of grain size and density. This determination does not include kernels that are broken or chipped and is done according to Industry Accepted Method 008 using a seed counter. Thousand kernel mass is reported on a 14% moisture basis.

Determination of sorghum kernel size by means of image analysis

Sorghum kernels were photographed on a Panasonic Lumix digital camera (DNC-LX3). Photos were analysed afterwards, using Digimizer version 4.0 software supplied by Medcalc (www.digimizer.com), to measure the size of the sorghum kernels. Photos of the samples are stored in a database. The following measurements were taken:

- Maximum length (indicated as "Length")
- Minimum length (indicated as "Width")
- Roundness (% Width/Length or W/L%).

Milling

All samples requiring milling were milled on a Retch ZM 200 mill fitted with a 0.5 mm screen.

Moisture

The moisture content of the milled grain was determined using ICC Standard 110/1 (latest edition). This method determines moisture content as a loss in weight of a sample when dried in a hot air ventilation oven at 130 °C for 2 hours. Moisture content results were used to report % starch and % protein on a dry basis (db).

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.

Total Starch Content

Determination of the total starch content was according to the SAGL In-house method 019, a polarimetric method based on the modified Ewers method. The starch content is released from the sample by boiling in dilute hydrochloric acid. The starch solution in the filtrate is determined by measuring the angle of polarisation or optical rotation of the filtrate with a polarimeter. The acid also helps to break down the endosperm tissue, ensuring complete release of the starch granules from the protein matrix. Substances, which may interfere with the measurement, are removed by filtration.

Mycotoxin analyses

Mycotoxins are fungal metabolites, toxic to animals and humans, that are produced by moulds commonly found in almost all types of grain. Aside from health risks, mycotoxin contamination can also reduce the value of the crops. Environmental factors such as temperature, humidity, soil and storage conditions influence toxin production.

SAGL implements a validated SAGL In-house multi-mycotoxin screening method using UPLC - MS/MS. A sub-sample of each sorghum sample was milled and tested for Aflatoxin B₁; B₂; G₁; G₂, Fumonisin B₁; B₂; B₃, Deoxynivalenol, 15-ADON, HT2 Toxin, T-2 Toxin, Zearalenone and Ochratoxin A.

Dehulling of samples

Each sorghum sample was sieved and the fraction below the 4 mm and above the 3.55 mm sieve was dehulled by means of a Barley pearler. This fraction was selected to obtain an indication of comparative hardness and to eliminate difference due to kernels size. Tests were conducted using 150 g of sample with a dehulling time of 70 seconds. These parameters are based on results obtained on the outcomes of a processing application project funded by the Sorghum Trust. Barley pearler fractions are sieved into three fractions:

- > 1.8 mm slotted sieve
- < 1.8 mm slotted sieve and > 2.38 mm round hole sieve, and
- < 2.38 mm round hole sieve.

The colour determinations for this project was done on the first fraction (> 1.8 mm).

Determination of colour

The Barley pearler fraction above the 1.8 mm slotted sieve was milled on a Retch mill through a 0.5 mm sieve. The milled samples' colour was determined with the Hunterlab Color-Flex 45/0 spectrophotometer on 10°/D65 according to SAGL Industry accepted method 004. The spectrophotometers operate in the Hunter L, a, b scale where:

L measures lightness and varies from 100 for perfect white to zero for black, approximately as it would be evaluated by the eye. The chromaticity dimensions (a and b) give understandable designations of colour as follows:

- a measures redness when positive, grey when zero, and greenness when negative.
- b measures yellowness when positive, grey when zero, and blueness when negative.



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 M Hammes (All Chemical Methods)
Ms A de Jager (Nutrients & Contaminants Methods)
Ms W Louw (In-house Methods 001, 002, 003, 010 & 026)
Ms D Moleke (Rheological Methods)
Ms I Terblanche (Rheological Methods)
Mrs H Meyer (All Chemical, Nutrients and Contaminants & Grading Methods)
Ms J Kruger (All Chemical Methods)
Ms M Motlanthe (In-house Methods 001, 003 & 026)
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Issue No.: 29

Date of Issue: 14 October 2019

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°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)

are sugar coated)		(72 hour; 103°C)
Maize Grits	Moisture (Oven Method)	Analytical EBC Method 6.2.2, latest edition (4 hours, 130°C)
Animal feed, Plant tissue and Sunflower (Milled)	Moisture (Oven Method)	AgriLASA 2.1, Latest Edition (5 hours, 105°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

Facility Number: T0116

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
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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



Government Gazette Staatskoerant

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GOVERNMENT NOTICES • GOEWERMENTSKENNISGEWINGS

DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES

NO. R. 15

08 JANUARY 2016

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

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

The Minister of Agriculture, Forestry and Fisheries acting under section 15 of the Agricultural Product Standards Act, 1990 (Act No. 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; and
- (c) read together with section 3(1) of the said Act, repealed the Regulations published by Government Notice No R.532 of 16 May 2008.

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;

"another group" in relation to --

- (a) sorghum of Class GM means sorghum that has a dark testa, and
- (b) sorghum of Class GH means sorghum that does not have a dark testa;

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

"consignment" means --

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

"container" means a bag or a bulk container;

"dark testa" means the testa layer of the sorghum that contains tannins of the condensed type;

"defective sorghum" means --

- (a) pieces of broken sorghum kernels; or
- (b) sorghum kernels --
 - (i) that are affected by fungi or diseases;

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- (ii) of which the embryo skin is cracked due to germination;
- (iii) that have a green colour or shows other signs of immaturity; and
- (iv) that have been damaged by insects, rodents, cold, heat or in any other manner, but does not include weather-stained sorghum;

"foreign matter" means any matter or substance other than sorghum. Coal, dung and metal shall not be present in the consignment concerned;

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

"poisonous seeds" mean seeds or part of seeds of plant species that in terms of the Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act No. 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;

"small kernel sorghum" means whole sorghum kernels that pass through a standard sieve;

"sorghum" means the threshed, ripe seed of plants of *Sorghum bicolor* (L.) Moench, but excludes broom sorghum, hay sorghum or cane sorghum;

"standard sieve" means is a slotted sieve --

- (a) with a flat bottom of metal sheet of 1,00 mm thickness with rectangular slots of 12, 7 mm in length and 1, 8 mm in width with rounded ends. 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 orientated, with a slot directly opposite the solid inter segment of the adjacent row of slots;
- (b) of which the upper surface of the sieve is smooth;
- (c) with a circular frame of suitable material with an inner diameter of at least 300 mm and maximum 310 mm and at least 50 mm high;
- (d) that fits onto a tray with a solid bottom and must be at least 20 mm above the bottom of the tray;

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

"unthreshed sorghum" means sorghum or pieces of sorghum still partially covered by glumes;

"weather-stained sorghum" means sorghum kernels of which more than one-third of the surface of the pericarp is distinctly discoloured by the weather, but does not include sorghum kernels with purple anthocyanic blotches in or on the pericarp; and

"white sorghum" means sorghum of which the pericarp does not display any of the shades of brown, red or yellow irrespective of any purple anthocyanic blotches in or on the pericarp.

Restriction on sale of sorghum

- 2. (1) No person shall sell a consignment of sorghum in the Republic of South Africa --
 - (a) unless the sorghum is sold according to the classes set out in regulation 3;

- (b) unless the sorghum complies with the standards for the class concerned as set out in regulation 4;
 - (c) unless the sorghum complies with the grades of sorghum and the standards for grades set out in regulations 5 and 6 respectively;
 - (d) unless the sorghum is packed in accordance with the packing requirements set out in regulation 7;
 - (e) unless the containers 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 sorghum contains a substance that renders it unfit for human 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).

PART I

QUALITY STANDARDS

Classes of sorghum

3 Sorghum shall be classified as --

- (a) Class GM;
- (b) Class GH; and
- (c) Class Other.

Standards for classes

4. (1) A consignment of sorghum shall be classified as Class GM Sorghum if it --
- (a) consists of malt sorghum that does not have a dark testa; and
 - (b) complies with the standards for the grade of Class GM sorghum as set out in regulation 6.
- (2) A consignment of sorghum shall be classified as Class GH sorghum if it --
- (a) consists of malt sorghum that has a dark testa; and
 - (b) complies with the standards for grades for Class GH Sorghum as set out in regulation 6.
- (3) A consignment of sorghum shall be classified as Class Other if it does not comply with the standards for Class GM, and GH Sorghum

Grades of sorghum

5 Sorghum shall be graded as --

- | | | | |
|-----|----------|-------|-----------|
| (a) | Class GM | (i) | Grade GM1 |
| | | (ii) | Grade GM2 |
| | | (iii) | Grade GM3 |

- | | | | | | |
|-----|-------|----|------|-------|-----|
| (b) | Class | GH | (i) | Grade | GH1 |
| | | | (ii) | Grade | GH2 |
- (c) No grades are determined for Class Other.

Standards for grades

6. (1) All grades of sorghum shall --
- (a) be free from black smearing as a result of smut;
 - (b) not contain 10 or more smut balls or portions of smut balls which are collectively equivalent to 10 or more smut balls, per 100 g of sorghum;
 - (c) be free from a musty, sour or other undesirable smell;
 - (d) be free from any substance that renders it unsuitable for human consumption or animal consumption or for processing into or utilisation thereof as food or feed;
 - (e) be free from stones, glass, metal, coal or dung;
 - (f) not contain more poisonous seeds than permitted in terms of the Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act No. 54 of 1972);
 - (g) with the exception of Class Other, be free from grain insects;
 - (h) with the exception of Class Other, have a moisture content of not more than 14 percent; and
 - (i) be free from animal filth.
- (2) Grades GM1, GM2, GM3, GH1 and GH2 shall not exceed the permissible deviations specified in columns 2, 3, 4, 5, and 6 of the Table in the Annexure, respectively, with regard to the nature of deviation specified in column 1 of the said table.
- (3) The presence of purple anthocyanic blotches in or on the pericarp shall not be taken into consideration when determining the grade of a consignment of sorghum.

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

7. Sorghum of different classes and grades shall be packed in different containers.

Marking requirements

8. (1) Each container or the accompanying sales documents of a consignment shall be marked or endorsed with the applicable class or grade of the sorghum or, in the case of sorghum that have been imported, the common name and the name of the country of origin thereof.

PART III**SAMPLING*****Obtaining of sample***

9. (1) A sample of a consignment of sorghum shall --
- (a) in the case of sorghum delivered in bags and subject to regulation 10, be obtained by sampling at least ten per cent of the bags chosen from that consignment at random, with a bag probe. Provided that at least 25 bags in a consignment shall be sampled and where a consignment consists of less than 25 bags, all the bags in that consignment shall be sampled; and
 - (b) in the case of sorghum 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 10 kg; and
 - (b) be thoroughly mixed 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) 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 sorghum taken from different bags in a consignment in terms of regulation 9(1) (a), it appears that the contents of those bags differ substantially --
- (a) the bags concerned shall be placed separately;
 - (b) all the bags in the consignment concerned shall be sampled with a bag probe in order to do such separation; and
 - (c) each group of bags with similar contents in that consignment shall for the purposes of these regulations be deemed to be a separate consignment.
- (2) If, after the discharge of a consignment of sorghum 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 the part of the consignment remaining in the bulk container as well as the sorghum already in the hopper shall be sampled anew with a bulk sampling apparatus or by catching, by means of a suitable container, at regular intervals quantities from the stream of sorghum flowing in bulk.

Working sample

11. (1) A working sample shall be obtained by dividing the representative sample of the representative or deviating sample of the consignment according to latest revision of the ICC (International Association for Cereal Chemistry) 101/1 method.

PART IV**INSPECTION METHODS*****Determination of class and presence of smut, undesirable smells, harmful substances, poisonous seeds, insects and animal filth***

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

- (a) the class thereof;
- (b) whether it is smeared black by smut;
- (c) whether it contains smut balls;
- (d) whether it has a musty, sour or other undesirable smell;
- (e) whether it contains any substance that renders it unsuitable for human consumption or for processing into or utilisation as food or feed;
- (f) whether it contains any poisonous seeds;
- (g) whether it contains any grain insects; and
- (h) whether it contains any animal filth.

Determination of percentage foreign matter

13. The percentage of foreign matter in a consignment of sorghum shall be determined as follows:

- (a) Obtain a working sample of at least 100 g of material from the sample of the consignment.
- (b) Remove all foreign matter by hand from the working sample and determine the mass thereof.
- (c) Express the mass thus determined, as a percentage of the mass of the working sample.
- (d) Such percentage shall represent the percentage of foreign matter in the consignment concerned.

Determination of percentage unthreshed sorghum

14. The percentage of unthreshed sorghum in a consignment of sorghum shall be determined as follows:

- (a) Obtain a working sample of at least 50 g of material from the sample from which all foreign matter has been removed.
- (b) Remove all unthreshed sorghum by hand from the working sample and determine the mass thereof.
- (c) Express the mass thus determined, as a percentage of the mass of the working sample.
- (d) Such percentage shall represent the percentage of unthreshed sorghum in the consignment concerned.

Determination of percentage defective sorghum content and percentage small kernel sorghum

15. The percentages of defective sorghum and small kernel sorghum in a consignment of sorghum shall be determined as follows:

- (a) Obtain a working sample of at least 50 g of material from a sample from which all foreign matter and unthreshed sorghum have been removed.
- (b) Place the working sample on a standard sieve.
- (c) Screen the working sample for 25 to 30 seconds by performing 30 movements of the standard sieve and collecting tray on an even horizontal surface and along the longitudinal axis of the slots of the sieve: Provided that each such movement shall consist of a to-and-fro movement of between 200 mm and 300 mm each.
- (d) Remove all defective grain sorghum kernels from those portions of the working sample that respectively remained in or on the standard sieve and were collected in the collecting tray and determine the joint mass thereof.
- (e) Express the mass thus determined, as a percentage of the mass of the working sample.
- (f) Such percentage shall represent the percentage of defective grain sorghum in the consignment concerned.
- (g) Determine the mass of the material that remained in the collecting tray after the removal of the defective sorghum kernels in terms of paragraph (d).
- (h) Express the mass thus determined as a percentage of the mass of the working sample.
- (i) Such percentage shall represent the percentage of small kernel sorghum in the consignment concerned.

Determination of percentage sorghum of another group

16. The percentage of sorghum of another group in a consignment of sorghum shall be determined as follows:

- (a) Obtain a working sample of at least 25 g of material from the sample from which all foreign matter, unthreshed sorghum, defective grain sorghum and small kernel sorghum have been removed.
- (b) Remove all sorghum of another group by hand from the working sample and determine the mass thereof.
- (c) Express the mass thus determined, as a percentage of the mass of the working sample.
- (d) Such percentage shall represent the percentage of sorghum of another group in the consignment concerned.

Determination of percentage white sorghum

17. The percentage of white sorghum in a consignment of sorghum shall be determined as follows:

- (a) Obtain a working sample of at least 25 g of material from the sample from which all foreign matter, unthreshed sorghum, defective sorghum and small kernel sorghum have been removed.

- (b) Remove all the white sorghum by hand from the working sample and determine the mass thereof.
- (c) Express the mass thus determined, as a percentage of the mass of the working sample.
- (d) Such percentage shall represent the percentage of white sorghum in the consignment concerned.

Determination of percentage weather-stained sorghum

18. The percentage of weather-stained sorghum in a consignment shall be determined as follows:
- (a) Obtain a working sample of at least 10 g of material from the sample from which all foreign matter, unthreshed sorghum, defective sorghum and small kernel sorghum have been removed.
 - (b) Remove all the weather-stained sorghum by hand from the working sample and determine the mass thereof.
 - (c) Express the mass thus determined, as a percentage of the mass of the working sample.
 - (d) Such percentage shall represent the percentage of weather-stained sorghum in the consignment concerned.

Determination of moisture content

19. The moisture content of a consignment of sorghum may be determined according to any suitable method: Provided that the results thus obtained complies with the maximum permitted errors for a class 1 moisture meter as detailed in ISO 7700/1-1984(E), based upon result of the 72 hour, 103°C oven dried method [the latest revision of the AACCI (American Association of Cereal Chemists International) Method 44-15A]

PART V

OFFENCES 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 A
TABLE**

PERMISSIBLE DEVIATIONS SORGHUM

1	2	3	4	5	6
Nature of deviation	Maximum extent to which defects are permissible in percentages				
	Grade GM1	Grade GM2	Grade GM3	Grade GH1	Grade GH2
1. Foreign matter (Reg 13)	1,5	2,0	3,0	1,5	3,0
2. Unthreshed sorghum (Reg14)	4,0	6,0	12,0	4,0	20,0
3. Defective sorghum (Reg 15)	3,0	10,0	20,0	3,0	20,0
4. Small kernel sorghum (Reg 15)	8,0	10,0	20,0	8,0	20,0
5. Total of defective sorghum and small kernel sorghum	10,0	10,0	20,0	10,0	20,0
6. Sorghum of another group (Reg 16)	4,0	6,0	10,0	4,0	*
7. White sorghum (Reg 17)	4,0	6,0	*	4,0	*
8. Total of Sorghum of another group and White Sorghum	6,0	10,0	*	6,0	*
9. Weather-Stained Sorghum	50,0	50,0	75,0	50,0	75,0

* No specification

