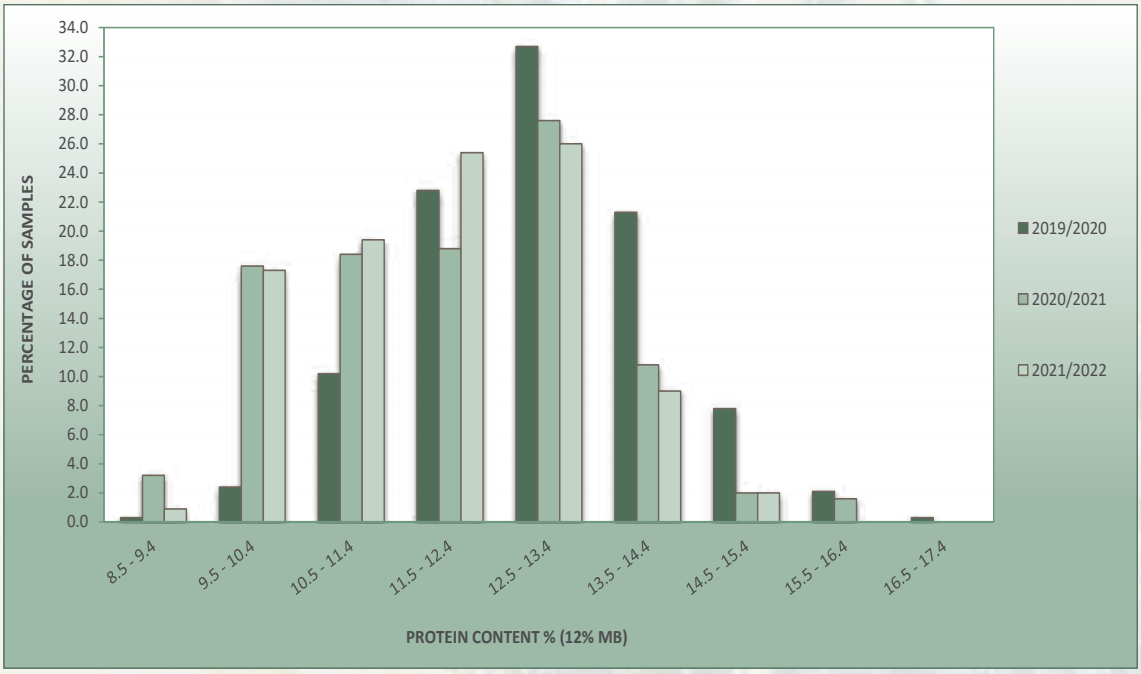
Crop quality of the 2021/22 season

All national, seasonal and regional averages provided in this report are weighted averages.

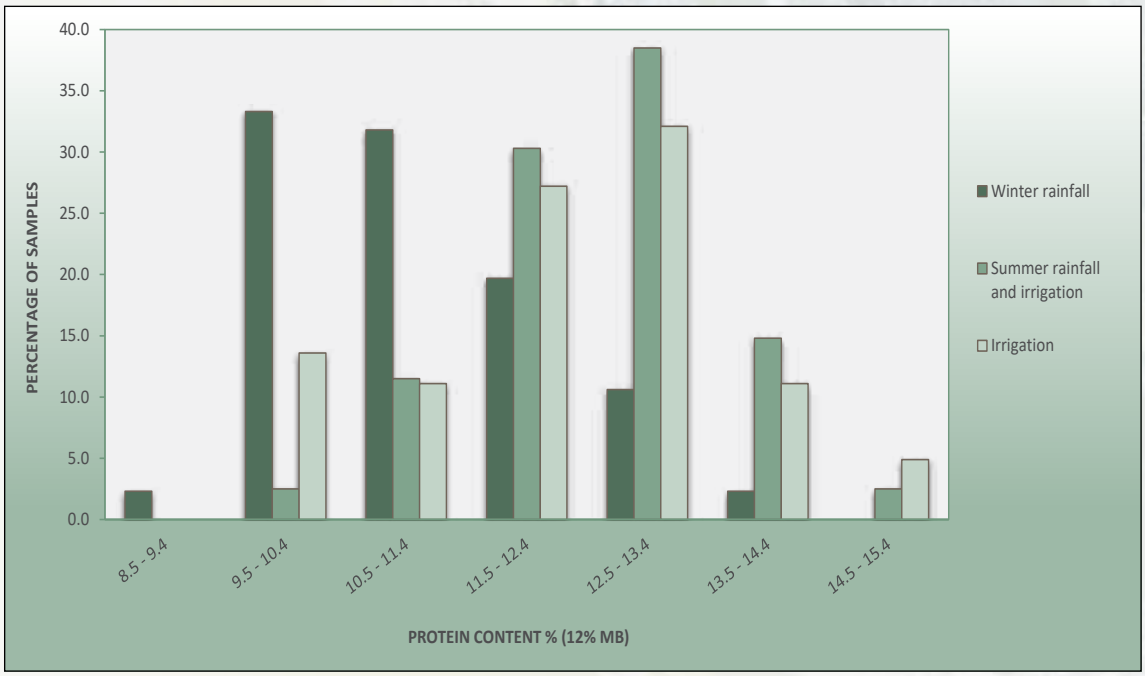
The national whole wheat protein average decreased slightly from 12.0% in the previous season to 11.9%. The ten-year national average is 12.1%. Protein content is generally a function of the growing environment (soil and climatic conditions) as well as fertiliser application. Please see Graphs 21 and 22 for the protein content distribution over the last three seasons and between the three major production areas during 2021/22.

Graph 21: Protein content distribution over the last three seasons



The Irrigation areas reported the highest whole wheat protein average, namely 12.5%. The production regions in the Winter rainfall area of the Western Cape averaged 11.1% and the Summer rainfall and irrigation areas of the Free State 12.2%.

Graph 22: Protein content distribution between the three production areas during the 2021/22 season



Flour protein content is on average 0.5 to 1.2% lower than that of whole wheat and averaged 10.9% this season, 0.3% percent lower than the previous season. The difference in the protein content between the whole wheat and flour protein, can be attributed to the removal of the bran and aleuron layer as well as the germ during milling. The protein content is reported on a 12% moisture basis.

The average hectoliter mass of 79.9 kg/hl is 1 kg/hl higher than the previous season but still 0.4 kg/hl lower than the ten-year national average of 80.3 kg/hl. 18 samples (5%) reported values below the 76 kg/hl minimum level for Super grade, Grade 1 and Grade 2 wheat, of these six samples originated in the Western Cape (Winter rainfall area), nine in the Free State, two in North West and one in Gauteng. Regional averages ranged from 78.8 kg/hl in the Free State, 79.2 kg/hl in the Western Cape and 81.3 kg/hl in the Irrigation areas.

The 1000 kernel mass, reported on a 13% moisture basis, increased from 38.2 g last season to 40.3 g this season. The 2019/20 season's average was 35.6 g. Averages over production areas varied from 39.7 g in the Summer rainfall and irrigation areas of the Free State to 40.1 g in the Winter rainfall areas and 41.0 g in the Irrigation areas. The weighted average percentage screenings obtained with a 1.8 mm slotted sieve was 1.20%, compared to the 1.63% and 1.92% of the previous two seasons respectively. The Summer rainfall and irrigation areas reported the highest average percentage, namely 1.49% and the Irrigation areas the lowest of 0.76%. 20 (6%) of the 335 samples exceeded the 3% maximum permissible screenings level for Super grade to Grade 3. Half of these samples originated in the Winter Rainfall areas.

The national weighted average falling number value was 341 seconds, lower than the 372 seconds of last season's average as well as the ten-year weighted average value of 364 seconds. 37 (11%) of the samples analysed for this survey reported falling number values below 250 seconds, 29 (9%) of these were below 220 seconds and were downgraded to COW as a result. These samples originated from the Free State (N=16), KwaZulu-Natal (N=7) and North West and Gauteng with 4 and 2 samples respectively. Last season 4% of the samples analysed as part of the survey, was downgraded to COW due to a low falling number. Falling number values this season ranged between 56 and 495 seconds. All falling number values reported, are corrected for the altitude at which the test is performed.

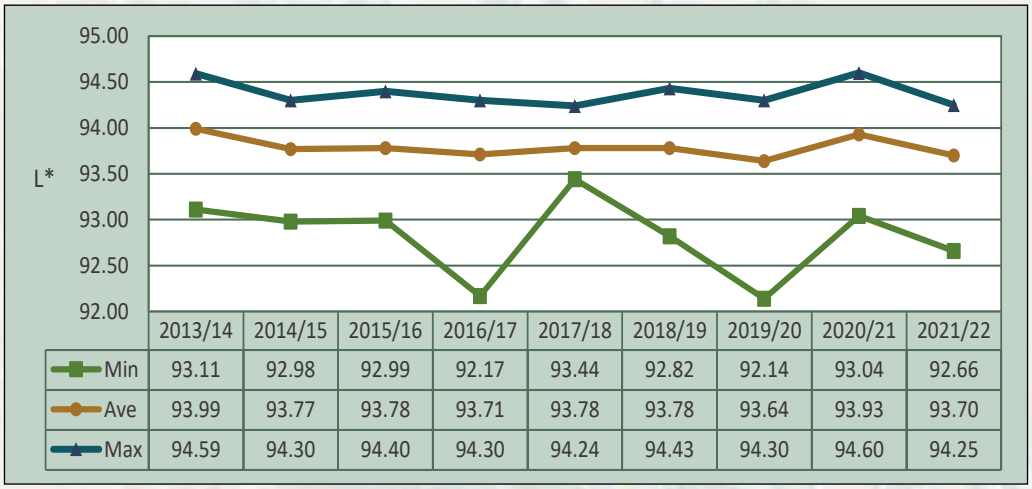
The weighted mixogram peak time on flour milled on the Quadromat Junior mill equaled the average 3.2 minutes of the 2020/21 season. The ten-year average is 2.9 minutes. The weighted mixogram peak time of the flour from the Bühler mill was 2.9 minutes, equal also to the previous season. Mixing time is a measure of optimum dough development and thus also of protein quality.

Extraction rate is an indication of the flour yield that can be obtained from a given amount of wheat. The extraction rate achievable on industrial scale mills is a number of percentage points higher than on laboratory scale mills due to an increase in roller surface area. Industrial type mills are also set to obtain optimum extraction rates within certain quality parameters, whereas the milling procedure and laboratory scale mill at SAGL is not set to optimise extraction but rather indicate differences in milling quality. Composite samples per class and grade per production region are cleaned, tempered/conditioned and then milled to facilitate flour and dough quality assessment. The weighted average Bühler MLU 202 laboratory mill extraction for the composite samples was 73.9% compared to the 74.1% of the previous season.

Colour is an important parameter of milled wheat since the colour of wheat flour affects the colour of the finished product, like the crumb colour of a loaf of bread. In general, a bright white colour flour is more desirable for most products. For the past nine seasons, a dry colour determination by means of a Konica Minolta CM-5 spectrophotometer has been done on the composite flour samples. The CIE L*a*b* (CIELAB) colour model uses lightness (L*) and two colour values (a* and b*), these colour coordinates define where a specific sample's colour lies in a Cartesian graph. L* represents lightness (100 being white and 0 being black), a* represents green to red variation and b* represents variation from blue to yellow. Please see Graphs 23 (L*), 24 (a*) and 25 (b*) for a comparison of the ranges in the CIE L*a*b* values obtained. The minimum and maximum values are based on a single composite sample's result in a specific season.

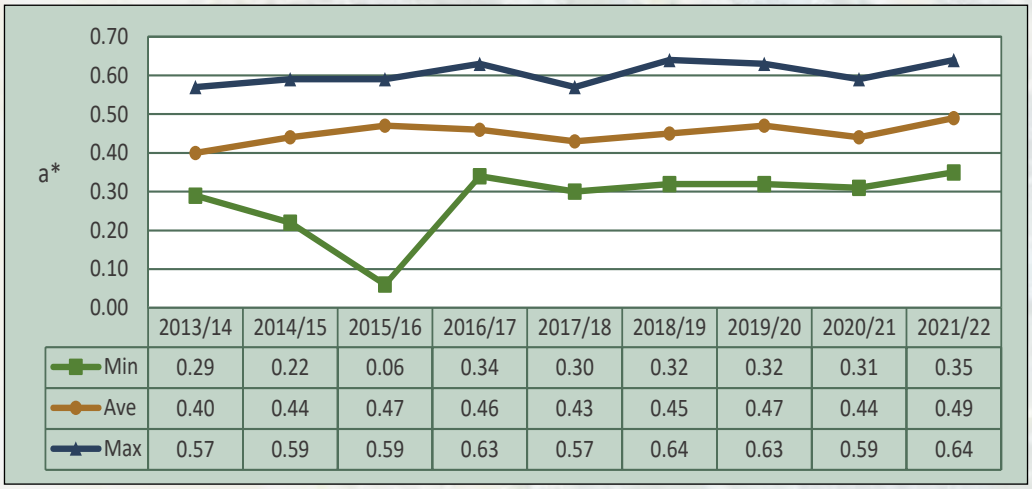
The average ash content was 0.60 % on a dry basis (moisture free basis), equal to the previous season's average. According to the Wheat product regulations (Government Notice No. R. 405 of 5 May 2017),

Graph 23: Range of L* values over nine seasons



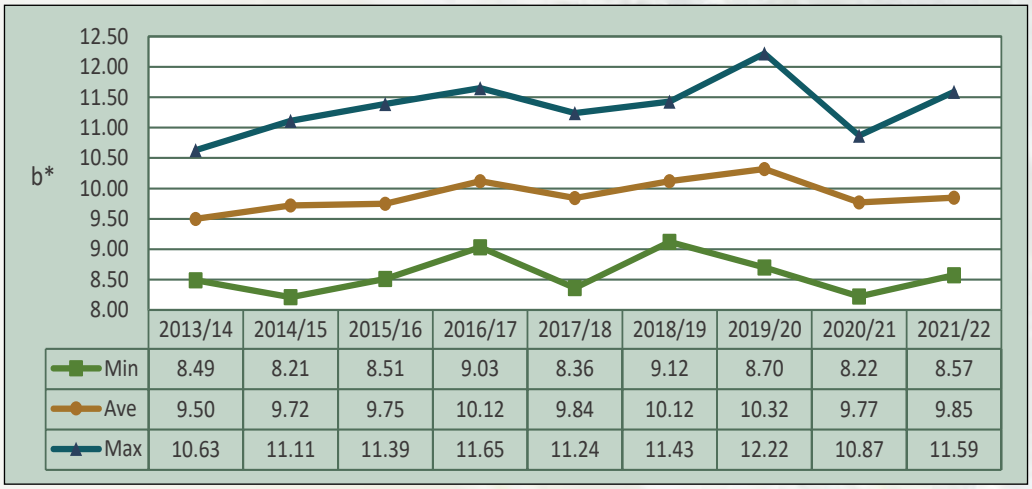
	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22
Min	93.11	92.98	92.99	92.17	93.44	92.82	92.14	93.04	92.66
Ave	93.99	93.77	93.78	93.71	93.78	93.78	93.64	93.93	93.70
Max	94.59	94.30	94.40	94.30	94.24	94.43	94.30	94.60	94.25

Graph 24: Range of a* values over nine seasons



	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22
Min	0.29	0.22	0.06	0.34	0.30	0.32	0.32	0.31	0.35
Ave	0.40	0.44	0.47	0.46	0.43	0.45	0.47	0.44	0.49
Max	0.57	0.59	0.59	0.63	0.57	0.64	0.63	0.59	0.64

Graph 25: Range of b* values over nine seasons



	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22
Min	8.49	8.21	8.51	9.03	8.36	9.12	8.70	8.22	8.57
Ave	9.50	9.72	9.75	10.12	9.84	10.12	10.32	9.77	9.85
Max	10.63	11.11	11.39	11.65	11.24	11.43	12.22	10.87	11.59

cake flour's ash content should not exceed 0.65%, white bread flour's ash content should be between 0.60 to 1.00% and that of all-purpose wheat flour between 0.55 and 0.75%.

The Rapid Visco Analyser (RVA) average peak viscosity of the samples analysed was 2081 cP (centipoise) (1213 – 2705 cP), the minimum viscosity 1619 cP (948 – 2007 cP) and the final viscosity 2326 cP (1339 – 3004 cP). The range of the values are provided in brackets. The previous season the average peak viscosity was 2211 cP (760 - 2661 cP), the minimum viscosity 1671 cP (473 – 2002 cP) and the final viscosity 2491 cP (763 – 3111 cP). The RVA test parameters were kept constant during all the analyses. Results are reported on a 14% moisture basis.

The wet gluten (14% mb) averaged 28.9% and the dry gluten, also on a 14% moisture basis, 9.6%. The previous season, these values averaged 29.9% and 10.1% respectively. The lower gluten values this season are expected given the lower average protein content compared to the 2020/21 season. The average gluten index value was 96 (similar to last season's 95) and ranged between 89 and 99. The gluten index provides an indication of the gluten strength (higher being better) and is not influenced by the protein content. A value between 70 and 100 is generally accepted as good quality for pan bread baking purposes.

The farinograph analysis resulted in an average water absorption of 60.0% (59.3% the previous season) and an average development time of 5.7 minutes (5.6 minutes the previous season). The stability value of 9.7 minutes was more than a minute longer than the previous average (8.5 minutes). The mixing tolerance index was 42, compared to the previous season's average of 36 BU.

The average alveogram strength was 42.5 cm^2 and the average P/L value 0.77 (38.3 cm^2 and 0.63 the previous season). The distensibility of the dough (121 mm) decreased on average compared to the previous season (129 mm). The average stability value increased from 75 mm to 86 mm this season.

The average extensogram strength increased from 99 cm^2 in the previous season to 103 cm^2. The maximum height in Brabender Units was also higher than last season, 393 BU in 2021/22 versus 362 BU in 2020/21. The average extensibility value this season was 191 mm compared to 200 mm the previous season.

The 100 g loaves baked using the straight-dough optimised bread making method, received an evaluation rated as "Excellent". The basis for this evaluation refers to the relationship between the protein content and the bread volume.

Mycotoxin analyses were performed on 40 wheat samples, randomly selected to represent different regions as well as grades. The samples were tested by means of a SANAS ISO/IEC 17025 accredited multi-mycotoxin method using UPLC-MS/MS. With this technique simultaneous quantification and confirmation of Aflatoxin B_1, B_2, G_1, G_2, Fumonisin B_1, B_2, B_3, Deoxynivalenol, 15-ADON, HT-2 Toxin, T-2 Toxin, Zearalenone and Ochratoxin A are possible in one run.

14 samples tested positive for deoxynivalenol (DON) residues, none of these samples exceeded the national maximum allowable level of 2 000 µg/kg for cereal grain intended for further processing. The average value of the 14 positive results was 484 µg/kg (ppb) and the highest value obtained 1 085 µg/kg. Last season, 13 samples (43%) tested positive for DON residues with an average value of 891 µg/kg (ppb), the highest value obtained was 3 088 µg/kg. This season, one sample also tested positive for Zearalenone residues, as was observed during the 2019/20 season. Please see the mycotoxin results in Table 6 on pages 66 and 67.

Amino acid profiles of local wheat were again determined as part of this survey, no amino acid analyses were performed during the 2020/21 season. Total amino acid analyses that included 18 amino acids namely Aspartic acid, Glutamic acid, Serine, Glycine, Histidine, Arginine, Threonine, Alanine, Proline, Tyrosine, Valine, Isoleucine, Leucine, Phenylalanine, Lysine, Tryptophan, Cystine and Methionine were performed on 40 samples, randomly selected to represent different regions as well as grades. Please see Table 7 on pages 69 and 70 for the results and page 78 for information on the methods followed.