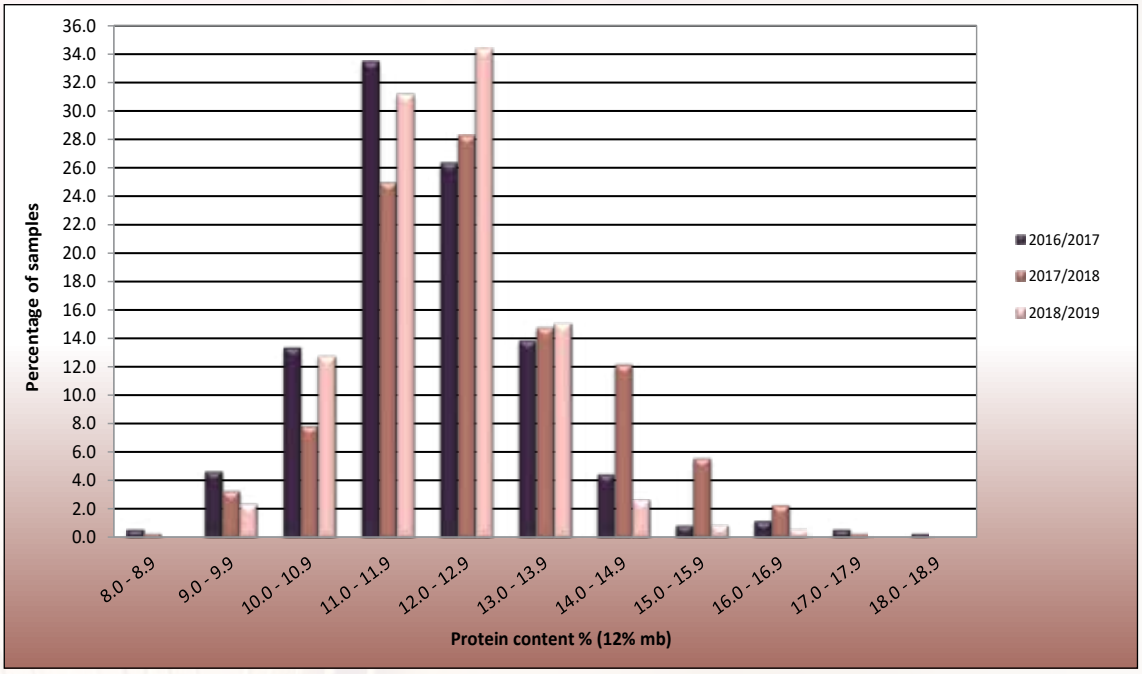
Crop quality of the 2018/2019 season

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

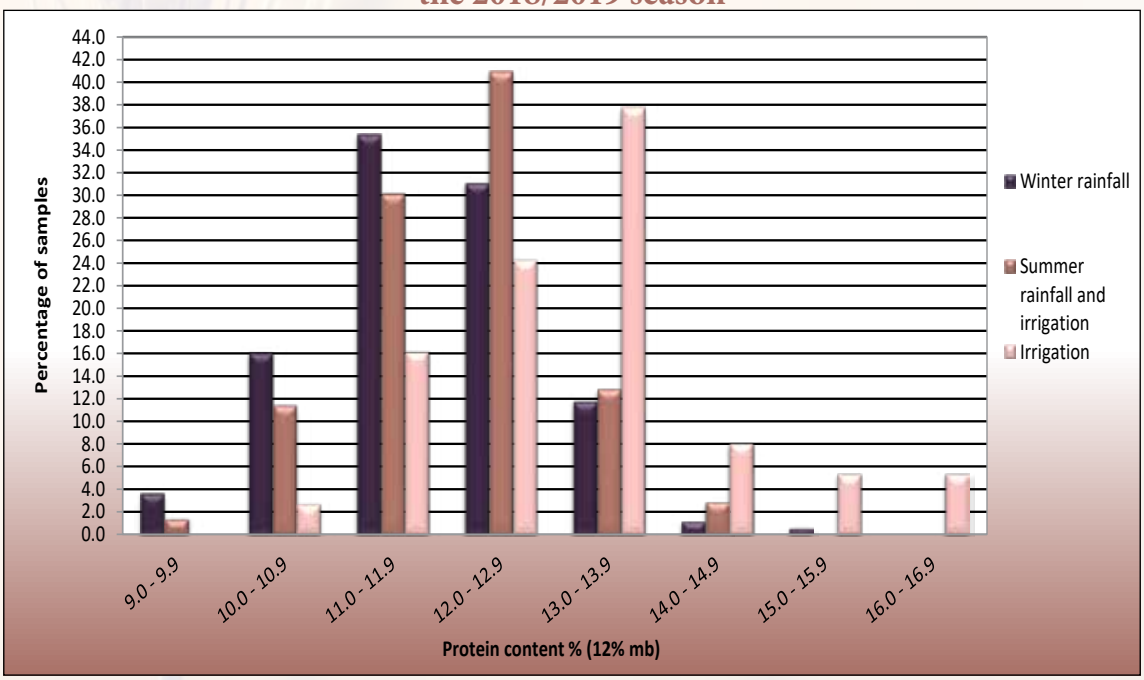
The national whole wheat protein average decreased from 12.6% in the previous season to 12.1%. The ten- year national average is 11.9%. Protein content is generally a function of the growing environment (soil and climatic conditions) as well as fertilizer application. Please see Graphs 19 and 20 for the protein content distribution over the last three seasons and between the three major production areas.

Graph 19: Protein content distribution over the last three seasons



The Summer rainfall and Irrigation areas of the Free State reported the highest whole wheat protein average, namely 13.1%. The Irrigation areas averaged 12.1% and the production regions in the Winter rainfall area of the Western Cape 11.8%.

Graph 20: Protein content distribution between the three production areas during the 2018/2019 season



Flour protein content is on average 0.5 to 1.2% lower than that of whole wheat and averaged 10.9% this season. The protein loss 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 increased by 0.6 kg/hl to 81.3 kg/hl compared to the previous season. The nine-year average for determinations done by means of the Kern 222 instrument is 80.7 kg/hl. Eight samples reported values below the 77 kg/hl minimum level for grade B1 wheat, of these four samples originated in the Western Cape (Winter rainfall area) and two each in the Free State and Mpumalanga. The regional averages ranged from 79.9 kg/hl in the Western Cape to 83.1 kg/hl in the Irrigation areas.

The 1000 kernel mass, reported on a 13% moisture basis, increased from 37.7 g last season to 39.2 g this season. The 2016/2017 season's average was 38.6 g. Averages over production areas varied from 36.1 g in the Free State to 40.2 g in the Irrigation areas. The weighted average percentage screenings obtained with a 1.8 mm slotted sieve was 1.49%, slightly lower than the previous season's 1.51% and also the lowest value of the last six seasons. The Winter rainfall areas reported the highest average percentage, namely 1.80% and the Irrigation areas the lowest of 1.07%. 24 (7%) of the 337 samples exceeded the 3% maximum permissible screenings level for grade B3 and of these, nine exceeded the 4% maximum permissible level for grade B4. Most of these samples originated in the Western Cape.

The national weighted average falling number value was 397 seconds, higher than last season's average as well as the ten-year weighted average value, both 371 seconds. Five of the samples analysed for this survey reported falling number values below 250 seconds and one of these were below 220 seconds. The samples originated from North West (N=2), Mpumalanga (N=2) and Limpopo (N=1). The highest average falling number value of 410 seconds, was reported for the Free State areas. All falling number values reported, are corrected for the altitude at which the test is performed. The results of this, as well as previous surveys, provide evidence that low falling number values are not a significant problem in South Africa.

The weighted mixogram peak time on flour milled on the Quadromat Junior mill averaged 2.8 minutes compared to the 2.7 minutes of the previous three seasons and slightly shorter than the ten-year average of 2.9 minutes. The weighted mixogram peak time of the flour from the Bühler mill was 2.6 minutes, equal to the previous three seasons. Mixing time, in general, decreases as protein content increases to about 12.0%, thereafter remaining approximately constant with flour protein increases.

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 optimize 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 70 composite samples was 71.3%, lower than the 73.1% of the previous season.

From the 2012/2013 survey, a dry colour determination by means of a Konica Minolta CM-5 spectrophotometer is done on the composite flour samples. Please see the comparison of the CIE L*a*b* values obtained below. The average and range (in brackets) are provided to assist with interpretation of these parameters:
2018/2019 season: L* 93.78 (92.82 – 94.43), a* 0.45 (0.32 – 0.64) and b* 10.12 (9.12 – 11.43)
2017/2018 season: L* 93.78 (93.44 – 94.24), a* 0.43 (0.30 – 0.57) and b* 9.84 (8.36 – 11.24)
2016/2017 season: L* 93.71 (92.17 – 94.30), a* 0.46 (0.34 – 0.63) and b* 10.12 (9.03 – 11.65)
2015/2016 season: L* 93.78 (92.99 – 94.40), a* 0.47 (0.06 – 0.59) and b* 9.75 (8.51 – 11.39)
2014/2015 season: L* 93.77 (92.98 – 94.30), a* 0.44 (0.22 – 0.59) and b* 9.72 (8.21 – 11.11)
2013/2014 season: L* 93.99 (93.11 – 94.59), a* 0.40 (0.29 – 0.57) and b* 9.50 (8.49 – 10.63)
2012/2013 season: L* 93.85 (93.14 – 94.39), a* 0.41 (0.26 – 0.54) and b* 9.92 (8.65 – 11.35)
L* represents lightness (100 being white and 0 being black), a* represents green to red variation and b* represents variation from blue to yellow.

The average ash content was calculated to be 0.60 % on a dry basis (moisture free basis), equal to the previous season. According to the Wheat product regulations (Government Notice No. R. 405 of 5 May 2017), 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 2218 cP (centipoise), the minimum viscosity 1675 cP and the final viscosity 2516 cP. Last season the values were 2269 cP, 1715 cP and 2548 cP respectively. The analysis conditions were kept constant during all the analyses. Results are reported on a 14% moisture basis.

The wet gluten (14% mb) averaged 30.1% and the dry gluten, also on a 14% moisture basis, 10.1%. The previous season, these values averaged 30.7% and 10.4% respectively. The average gluten index value was 94 (93 last season), ranging between 71 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 60.5% (60.3% the previous season) and an average development time of 5.0 minutes (5.5 minutes the previous season). The stability value of 7.0 minutes was one minute shorter than the previous average, but still within the acceptable range. There was also no significant difference between the mixing tolerance indexes of these two seasons, namely 41 BU and 40 BU respectively.

The average alveogram strength was 34.6 cm^2 and the average P/L value 0.81 (39.2 cm^2 and 0.81 the previous season). The distensibility of the dough as determined by the Alveograph decreased compared to the previous season, indicating a more elastic dough. The stability value was equal to last season.

The average extensogram strength was 92 cm^2 (106 cm^2 previous season), confirming the weaker dough strength trend observed with the Alveograph. The maximum height in Brabender Units were also lower than last season (350 BU in 2018/2019 and 382 BU in 2017/2018). The extensibility values compared well, 191 mm now and 198 mm previously.

The 100 g loaves baked using the straight-dough optimized 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.

This is the third season that amino acid profiles of local wheat were determined as part of this survey. 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 forty samples, randomly selected to represent different regions as well as grades. Please see Table 7 on pages 70 and 71 for the results and page 79 for information on the methods followed.

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 screening 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 is possible in one run.

Five samples tested positive for deoxynivalenol (DON) residues. The average value of the five positive results was 217 µg/kg (ppb) and the highest value obtained 361 µg/kg, which is well below national and international maximum allowable levels. Please see the mycotoxin results in Table 6 on pages 66 and 67. Last season, seven samples tested positive for DON residues with an average value of 202 µg/kg (ppb), the highest value obtained was 570 µg/kg.