2016/17 Wheat & Barley Harvest Grain Sample Analysis

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FGP - 2016/17 Wheat& Barley Harvest Grain Sample Analysis

1.0 Key Observations

- 114 wheat and 47 barley samples from the 2016/17 harvest were collected and analysed using AusScan NIR calibrations.
- Samples had segregation, test weight and screenings data provided from grain accumulator.
- Data was collated and compared to the previous year's data collection.
- Protein levels are considerably lower than previous years.
- Feed wheat segregations demonstrate low protein, average is 10.0% and much lower than previous harvests.
- It is speculated that the seasonal growing conditions resulting in record crop yield has provided lower protein grains.
- The data reconfirms the need for feed grain users to obtain laboratory test results for grains in use due to the high level of variability between samples.

2.0 Overview of Sample Collection and Testing

The Feed Grain Partnership has for the fourth harvest year completed grain testing using the AusScan NIR technology to assess grain quality. This report provides results from 114 wheat and 47 barley samples collected from Queensland, New South Wales, Victoria, South Australia, Western Australia and Tasmania. Samples were from grain harvested from the 2016/17 growing season.

Samples collection was targeted to ASW and FED wheat and F1 and F2 barley samples. Some milling wheat samples were included within the samples collected.

NSW Department of Primary Industries at Wagga Wagga completed NIR scans on the samples collected and AusScan calibrations, via Aunir's on line AusScan service, were used to predict grain quality. Test weight and screenings data was collected from grain receival site service providers.

Acknowledgment is provided to representatives from Grainflow, TAP Agrico, Stirling to Coast Farmers and FAR for their support in providing access to their 2016/17 harvest grain samples. A larger number of Tasmanian wheat samples were tested due to sample availability from a research project.

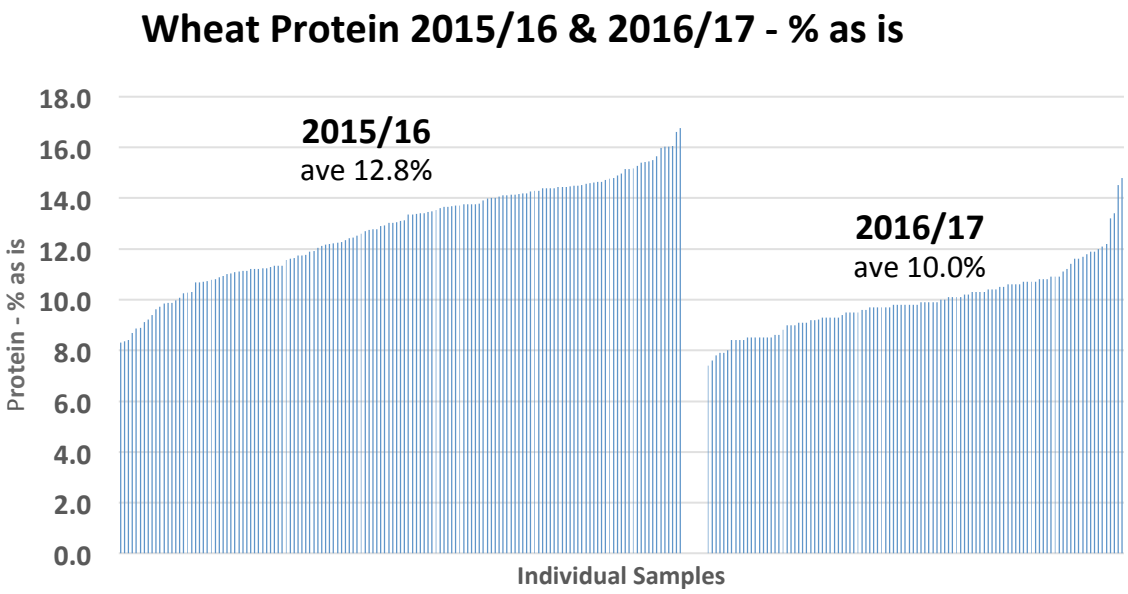
3.0 Results and Discussion

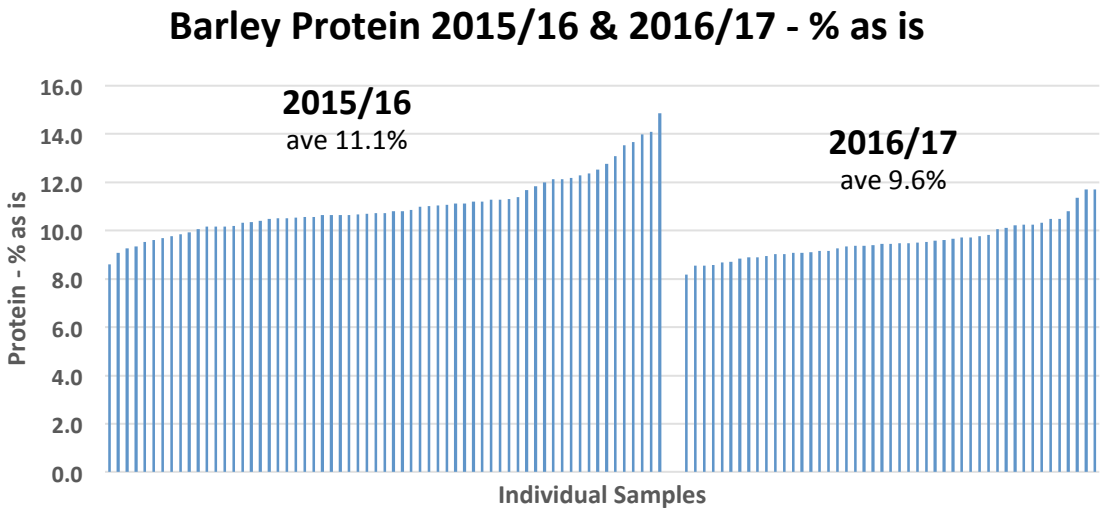
The following figures provide data for the main AusScan results as well as test weight and screenings.

Protein, Screenings & Test Weight

The 2016/17 harvest was characterised as high yielding, with ABARE reporting record wheat and barley production at 35.1 and 13.4 MMT respectively. The record crop provided record yield at 2.7 t/ha for wheat and 3.3t/ha for barley. Based on the high yielding crop, it is of interest to see what impact this may have had on wheat and barley nutritional content.

Protein results for wheat and barley from the 2016/17 harvest, shown in the figures below, are considerably lower than the 2015/16 results. The two harvest years are in contrast with 2015/16 having a drier finish resulting in lower test weight and higher protein grain. The 2016/17 harvest has provided higher yields and lower protein. It is apparent that feed grain users need to be testing grain protein to ensure feed formulations take account of the lower protein content from this year's harvest. Based on standard deviation results, the 2016/17 harvest samples provide considerably more consistent protein, unlike 2015/16 and 2014/15 when there was larger variation due to seasonal conditions. For 2016/17, with ample soil moisture during crop finish, grain filled and record yields were obtained, this corresponding with lower grain protein results.





With higher crop yield, there is typically a correlation with an increase in test weight. The average test weight for wheat increased by 1.2kg/hl and barley 4.3kg/hl compared to the 2015/16 harvest samples tested. It is however of note that 15% of wheat samples were found to be below 76kg/hl,

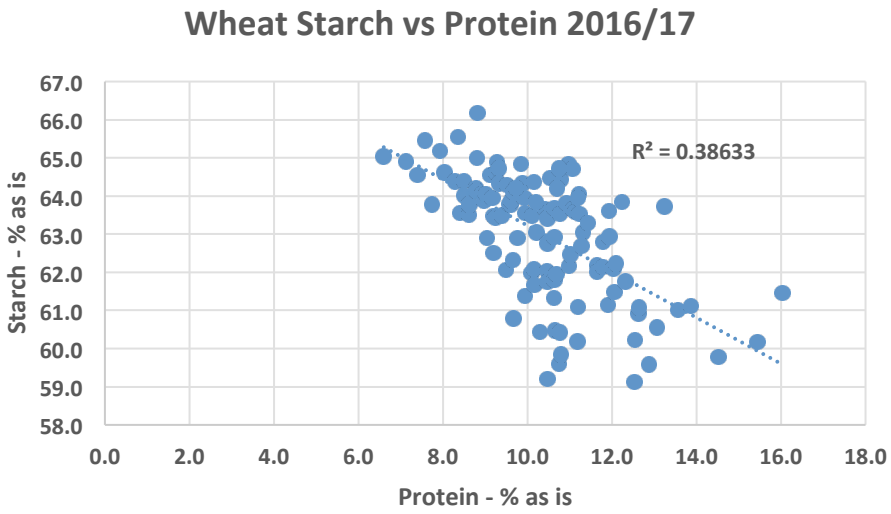
this being the GTA trading standard for ASW wheat. This level of lower test weight samples is only just below that found with the 2015/16 samples tested. From this year's harvest, there are known to be some grain coming from either frosted crops or others that were water logged as well as lodged and may have limited the crops capacity to finish. It is speculated that some of the samples tested have come from such production areas.

There were a number of wheat and barley samples with higher than expected screenings levels.

WHEAT	2016/17	2015/16	2014/15
Protein % as is basis			
Min	7.4	8.4	6.9
Mean	**10.0**	**13.5**	**10.6**
Max	14.8	16.7	16.2
Std Dev	*1.33*	*2.13*	*2.40*
Test Weight kg/hl			
Min	68.2	71.1	66.6
Mean	**80.4**	**79.2**	**78.2**
Max	88.6	84.9	86.0
Screenings %			
Min	0.5	0.1	1.3
Mean	**5.2**	**3.8**	**7.0**
Max	26.9	17.9	41.2

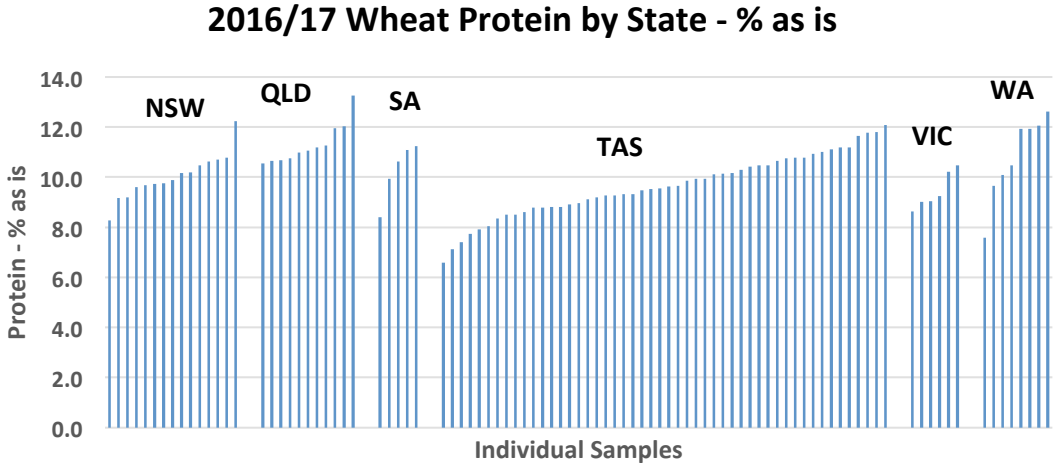
BARLEY	2016/17	2015/16	2014/15
Protein % as is basis			
Min	8.2	8.6	8.4
Mean	**9.6**	**11.1**	**10.4**
Max	11.7	14.8	12.4
Std Dev	*0.79*	*1.26*	*1.70*
Test Weight kg/hl			
Min	58.2	58.5	65.4
Mean	**68.4**	**64.1**	**69.6**
Max	74.2	69.5	72.4
Screenings %			
Min	3.2	0.4	3.0
Mean	**16.8**	**13.7**	**21.5**
Max	37.4	58.7	35.7

The correlation between wheat starch and protein is shown below with the trend for lower protein samples to be higher in starch.



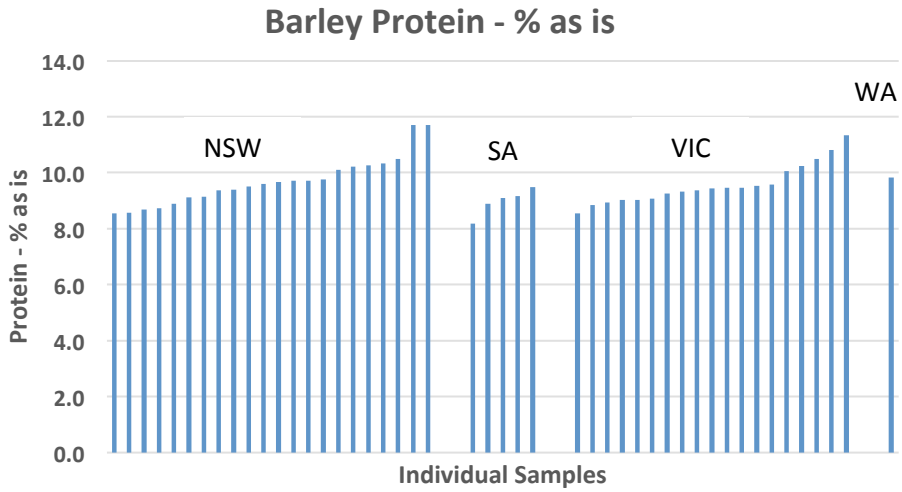
State Differences

Splitting samples between states identifies the lower wheat proteins for 2016/17 for all states except Qld. The level of variation between individual samples is seen in the figure below. There were a number of very low protein samples, less than 8%, from Tasmania.



Barley protein was low for all states. Included from NSW were samples from Northern NSW that were higher in protein than those from Central and Southern NSW:

NSW Region	Ave Protein
Northern NSW	10.5%
Central NSW	8.8%
Southern NSW	9.6%



Wheat Segregation Differences

The wheat data was seperated by receival segregation, with the average protein results shown below. Higher protein results are seen in milling wheat versus ASW and feed wheat segregations. For feed grain users, there has been a large drop in protein for feed wheat as the prior year had significant volumes of lower test weight, higher screenings and higher protein wheat segregated into feed. It would seem that low protein is a major reason why wheat has been downgraded to feed segregations in 2016/17. In previous years there have been more low test weight and high screenings content samples downgraded to feed wheat.

Table: Protein by Wheat Segregations

	Milling (H2, APW1, APW2)	ASW	Feed
Min	10.8	8.3	6.6
Average	**12.7**	**10.1**	**9.9**
Max	16.0	12.0	12.6

The data in the table below provides 2016/17 protein results for either all samples or feed wheat only samples. It is seen that the average feed only results are lower and highlights the fall in protein levels with this year's harvest. Queensland was the only state where wheat protein did not decline.

Table: Average Wheat Protein % as is by State

	Average 2016/17 all wheat samples	2016/17 "feed" wheat samples only	Average 2015/16 all wheat samples
QLD	13.2	11.4	12.6
NSW	10.8	9.8	13.3
VIC	10.5	9.4	14.5
SA	11.0	10.3	13.9
WA	10.8	10.8	12.6
TAS	9.7	9.7	10.8

AusScan Nutritional Predictions 2016/17

AusScan predicted data from the ASW and Feed wheat (excludes the milling wheat samples) and Feed barley samples are provided below. Higher moisture results were found in WA and Tas wheat samples tested.

There were no barley samples from Queensland And only one sample from Western Australia. The table below only includes NSW, Vic and SA results.

WHEAT	Moisture (%)	Fat (as is) (%)	Protein (as is) (%)	Crude Fibre (as is) (%)	Ash (as is) (%)	Starch (as is) (%)
QLD	10.1	1.8	13.2	2.6	1.2	63.0
NSW	10.0	1.8	10.8	2.6	1.1	63.1
VIC	9.7	1.8	10.5	2.8	1.1	62.3
SA	10.4	1.8	11.0	2.6	1.1	62.4
WA	12.8	1.9	10.8	2.1	1.1	62.3
TAS	12.1	1.8	9.7	2.2	1.1	63.3
All Samples	**11.1**	**1.8**	**10.0**	**2.7**	**1.1**	**63.0**
Std Dev	1.34	0.09	1.70	0.39	0.20	1.59

BARLEY	Moisture (%)	Fat (as is) (%)	Protein (as is) (%)	Crude Fibre (as is) (%)	Ash (as is) (%)	Starch (as is) (%)
NSW	10.3	2.4	9.7	7.8	2.2	49.6
SA	10.9	2.3	9.0	7.6	2.2	48.4
VIC	10.1	2.4	9.6	7.7	2.2	49.6
All Samples	**10.3**	**2.4**	**9.6**	**7.7**	**2.2**	**49.4**
Std Dev	0.49	0.11	0.79	0.53	0.11	1.48

WHEAT	Broiler AME (as is) (MJ/kg)	Pig Faecal DE (as is) (MJ/kg)	Pig Ileal DE (as is) (MJ/kg)	Cattle Estimated ME (DM) (MJ/kg)
QLD	12.9	14.0	12.1	12.8
NSW	12.9	13.9	12.1	12.8
VIC	12.8	13.9	12.0	13.0
SA	12.8	13.9	12.0	12.9
WA	13.4	13.8	12.1	12.9
TAS	13.1	13.7	11.8	12.9
All Samples	**13.0**	**13.8**	**12.0**	**12.9**
Std Dev	0.31	0.16	0.32	0.11

BARLEY	Broiler AME (as is) (MJ/kg)	Pig Faecal DE (as is) (MJ/kg)	Pig Ileal DE (as is) (MJ/kg)	Cattle Estimated ME (DM) (MJ/kg)
NSW	12.2	12.6	10.3	12.0
SA	12.0	12.4	10.1	12.2
VIC	12.0	12.5	10.3	12.1
All Samples	**12.1**	**12.5**	**10.3**	**12.1**
Std Dev	0.30	0.18	0.22	0.18

Pig Faecal DE

The AusScan Pig DE predictions for 2016/17 identifies a small reduction of 0.3MJ/kg for wheat and 0.4 MJ/kg for barley compared to 2015/16.

	2016/17	2015/16	2014/15	2013/14
Pig DE MJ/kg as fed				
WHEAT				
Min	13.5	13.7	13.5	13.2
Mean	**13.8**	**14.1**	**14.0**	**14.0**
Max	14.4	14.4	14.4	14.4
BARLEY				
Min	12.2	12.6	12.6	12.7
Mean	**12.5**	**12.9**	**13.0**	**12.9**
Max	13.0	13.2	13.3	13.1

Samples tested were composite receival samples and greater variability is expected from individual load samples. The lower pig DE average result is found even though starch content increased for 2016/17. This result is not unexpected, as the Premium Grains for Livestock Program research identified that there are various factors that affect available energy, and grain starch content is not correlated with available energy. The factors increasing energy available to monogastrics are:

- Thin, fragile endosperm walls
- Low arabinoxylan & ß-glucan content
- Low whole grain viscosity – for poultry
- Soft grains, high water holding capacity
- Low hull content

Broiler AME

Broiler AME average at 13.0MJ/kg is higher than the 2015/16 and similar to 2013/14 and 2014/15 results. Broiler AME for Western Australian and Tasmanian wheat samples were marginally above average. Barley Broiler AME results increased by 0.6MJ/kg and consistently higher than the previous three years average results.

	2016/17	2015/16	2014/15	2013/14
Broiler AME MJ/kg as fed				
WHEAT				
Min	12.2	11.9	12.4	11.9
Mean	**13.0**	**12.4**	**12.9**	**13.1**
Max	13.6	13.1	14.0	13.7
BARLEY				
Min	11.4	10.5	10.7	11.1
Mean	**12.1**	**11.5**	**11.2**	**11.5**
Max	13.0	12.1	11.7	12.0

Cattle ME

For wheat Cattle AME is very similar to 2013/14 and 2014/15 and higher than the 2015/16 average. Barley results are consistent between years.

	2016/17	2015/16	2014/15	2013/14
Cattle ME MJ/kg DM basis				
WHEAT				
Min	12.6	12.5	12.7	12.4
Mean	**12.9**	**12.6**	**12.8**	**12.9**
Max	13.1	12.7	13.1	13.1
BARLEY				
Min	11.6	12.0	11.9	12.0
Mean	**12.1**	**12.2**	**12.3**	**12.2**
Max	12.4	12.4	12.7	12.5

The PGLP research work identified factors that provide higher Cattle ME are:

- Thick, intact endosperm cell walls
- High arabinoxylan content
- High whole grain viscosity
- Hard grains
- Low fibre & hull content
- Low acidosis index (extent and rate of rumen fermentation)

Notes of Caution:

1. Results provided are based on sourcing samples and the reader needs to take care in comparing results for year to year and between states. FGP does not present this report as being representative of the entire crop harvested and advises feed grain users to conduct their own testing work.

2. The AusScan calibrations are based on *in vivo* feeding research, where grains were milled under research controlled conditions. This included hammer milling for pigs and poultry and dry rolling for

cattle. Under commercial conditions, there maybe limitations in milling capacity and a greater chance of small whole grains passing into finished feeds. Under these conditions, grain containing higher screenings may result in lower available energy levels.