



U.S. WHEAT
ASSOCIATES

The World's Most Reliable Choice

2017 CROP QUALITY REPORT

To Our Valued Customers:

I am very pleased to introduce my first annual Crop Quality Report as President of U.S. Wheat Associates (USW). This report is one of the most important activities we conduct each year on behalf of the U.S. wheat farmers we represent, and it creates one of the most useful tools available for buyers and users of U.S. wheat. It is the foundation for the time-honored trade service and technical support that my USW colleagues provide.

As you review the 2017 report, please note that you are best served by using the data as a baseline of performance, which you may compare to your own results. Next, U.S. wheat farmers have again overcome many challenges to produce wheat of the best quality and value. And our experienced representatives are always available, with your success as their priority.

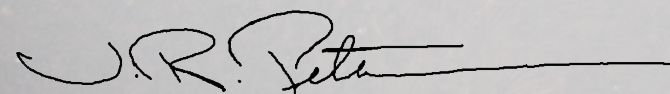
To compile this report, USW works closely with state wheat commission members, USDA's Foreign Agricultural Service, as well as many public and private service providers who collect and analyze the samples and tabulate results. We thank our staff and all our partners for their efforts again this year. We also warmly thank our farmers for their earnest efforts and steadfast stewardship in producing wheat with excellent quality in ways that are more and more sustainable.

Yes, the pressure of low farm gate prices again reduced planted area for five of our six wheat classes. And Mother Nature pared production even more. Yet the results show significant quality and performance improvement for 2017 that end users will find valuable.

Hard Red Winter wheat protein levels were higher and this class should produce good flour yields on the mill. Buyers can expect to pay more for a much smaller Hard Red Spring wheat crop, but it grades as No. 1 U.S. DNS and shows a significant jump in protein. Protein levels in the U.S. Durum crop are also up for 2017. Soft Red Winter wheat production was also down, but the crop is clean and sound with very low DON levels. Farmers again produced abundant supplies of the most desirable, excellent quality, low moisture, lower protein Soft White wheat.

As I begin this leadership role after more than 30 years at USW, I am very optimistic about the future for U.S. farmers and the global wheat foods processing industry. Through difficult challenges and good times, customers have remained loyal and productive users of U.S. wheat. We appreciate our long-standing partnership and we thank you! Please feel free to contact me at any time with questions, ideas or concerns, and know that our team and I will keep doing all we can to continue earning your business.

Sincerely,



Vince Peterson, President
U.S. Wheat Associates

**U.S. Wheat Associates
is funded by the U.S.
Department of Agriculture's
Foreign Agricultural Service,
and by wheat producers
through the following
member organizations:**

Arizona Grain Research and
Promotion Council

California Wheat Commission

Colorado Wheat
Administrative Committee

Idaho Wheat Commission

Kansas Wheat Commission

Maryland Grain Producers
Utilization Board

Minnesota Wheat Research
and Promotion Council

Montana Wheat &
Barley Committee

Nebraska Wheat Board

North Dakota Wheat Commission

Ohio Small Grains
Marketing Program

Oklahoma Wheat Commission

Oregon Wheat Commission

South Dakota Wheat Commission

Texas Wheat Producers Board

Washington Grain Commission

Wyoming Wheat
Marketing Commission

TABLE OF CONTENTS

2017 Crop Quality Report Overview	2
2017 Production, Supply and Demand	3
What the Tests Mean	4
Hard Red Winter	7
Hard Red Spring	14
Hard White	21
Durum	26
Soft White	31
Soft Red Winter	37
Analysis Methods	42
Wheat Grades and Grade Requirements	44





2017 PRODUCTION, SUPPLY AND DEMAND

U.S. PRODUCTION BY CLASS

Crop Year (Beginning June 1) (million metric tons)

	2017	2016	2015	2014	2013
Hard Red Winter	20.4	29.5	22.6	20.1	20.3
Hard Red Spring	10.5	13.4	15.4	15.1	13.4
Hard White	0.9	0.9	0.6	0.6	0.6
Durum	1.5	2.8	2.3	1.5	1.7
Soft White	6.1	6.9	5.4	5.5	6.8
Soft Red Winter	7.9	9.4	9.8	12.4	15.5
Total	47.4	62.9	56.1	55.1	58.1

Based on USDA crop estimates as of September 29, 2017.

U.S. SUPPLY AND DEMAND

Estimated for 2017/18 (year beginning June 1)

	HRW	HRS	Durum	White	SRW	TOTAL
Beginning Stocks	16.0	6.4	1.0	2.9	5.9	32.1
Production	20.4	10.5	1.5	7.0	7.9	47.4
Imports	0.2	2.0	1.2	0.3	0.4	4.1
Total Supply	36.7	18.9	3.7	10.2	14.2	83.6
Domestic Use	12.8	7.2	2.4	2.7	5.8	30.9
Exports	10.6	7.2	0.5	5.7	2.4	26.5
Total Demand	23.4	14.5	2.9	8.4	8.2	57.5
Ending Stocks	13.3	4.4	0.7	1.7	6.0	26.1
Stocks Five-year Average	8.9	5.3	0.7	1.7	4.0	20.6

Based on USDA Supply/Demand estimates as of October 12, 2017.



2017 CROP QUALITY REPORT OVERVIEW

SUMMARY OF CLASSES

	Hard Red Winter ¹		Hard Red Spring		Northern Durum ²		Desert Durum [®]		Soft White		Soft Red Winter	
	2017	5-Year Avg	2017	5-Year Avg	2017	5-Year Avg	2017	5-Year Avg	2017	5-Year Avg	2017	5-Year Avg
Test Weight (lb/bu)	60.5	60.3	61.6	61.6	60.9	60.4	62.2	62.7	60.9	60.6	59.1	58.4
(kg/hl)	79.6	79.3	81.0	81.0	79.4	78.7	81.0	81.7	80.1	79.7	77.7	76.9
Grade	1 HRW	1 HRW	1 NS	1 NS	1 HAD	1 HAD	1 HAD	1 HAD	1 SW	1 SW	2 SRW	2 SRW
Dockage (%)	0.6	0.6	0.5	0.6	1.1	0.7	0.5	0.4	0.5	0.5	0.4	0.6
Wheat Moisture (%)	11.0	11.2	12.0	12.1	11.3	11.5	6.6	6.7	8.9	9.3	13.0	12.9
Wheat Protein (%) ³	11.4	12.6	14.6	14.0	14.5	13.6	13.5	13.6	9.6	10.2	9.5	9.8
Wheat Ash (%) ³	1.50	1.53	1.51	1.52	1.46	1.59	1.66	1.73	1.32	1.36	1.45	1.48
1000 Kernel Weight (g)	31.0	29.4	30.7	31.1	38.4	39.6	49.0	48.4	35.5	34.6	34.0	32.7
Wheat Falling Number (sec)	368	401	383	381	380	380	717	517	337	336	319	306
Flour/Semolina Extraction (%)	78.1	75.2	71.2	67.8	68.5	65.2	70.0	62.1	73.5	75.1	68.9	70.9
Flour/Semolina Ash (%) ³	0.64	0.56	0.58	0.50	0.69	0.68	0.80	0.86	0.40	0.51	0.44	0.45
Wet Gluten (%)	25.3	29.2	35.8	34.2	34.5	34.8	33.0	33.6	21.7	23.4	21.3	21.8
Farinograph:												
Peak Time (min)	4.5	5.2	7.5	7.1	n/a	n/a	n/a	n/a	2.2	2.2	1.3	1.4
Stability (min)	6.1	9.2	10.7	11.3	n/a	n/a	n/a	n/a	2.8	2.8	2.2	2.6
Absorption (%)	60.5	59.5	63.0	63.0	n/a	n/a	n/a	n/a	51.5	53.9	53.2	52.9
Alveograph W (10 ⁻⁴ J)	199	239	360	362	180	135	266	228	84	100	92	80
Loaf Volume (cm ³)	806	840	968	973	n/a	n/a	n/a	n/a	n/a	n/a	720	703
Production (MMT)	20.4	23.9	10.5	14.2	1.2	1.7	0.3	0.5	6.1	6.2	7.9	11.7
	Page 10	Page 18	Page 30	Page 30	Page 34	Page 40						

¹Hard red winter data does not include California.

²Durum extraction and ash values are for semolina.

³Protein - 12% moisture basis; ash - 14% moisture basis.

PLANTING AND HARVEST DATES

Wheat	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HRW Planting	█											
HRW Harvest												
HRS Planting												
HRS Harvest												
HW Planting												
HW Harvest												
Durum Planting	█											
Durum Harvest												
SW Planting												
SW Harvest												
SRW Planting												
SRW Harvest												

█ California-Arizona Planting Dates
 █ California-Arizona Harvest Dates
 █ Other States Planting Dates
 █ Other States Harvest Dates



WHAT THE TESTS MEAN

WHEAT GRADE TESTS

Wheat grades reflect the physical quality and condition of a sample and thus may indicate the general suitability for milling. The U.S. grade for a sample is determined by measurement of such factors as test weight, damaged kernels, foreign material, shrunken and broken kernels and wheat of contrasting classes. (See table on page 44.) All numeric factors other than test weight are reported as a percentage by weight of the sample. Grade determining factors include:

- **TEST WEIGHT** is a measure of the density of the sample and may be an indicator of milling yield and the general condition of the sample, as problems during growing season or at harvest often reduce test weight.
- **DAMAGED KERNELS** are kernels which may be undesirable for milling because of disease, insect activity, frost or sprout damage, etc.
- **FOREIGN MATERIAL** is any material other than wheat that remains after dockage is removed. Because foreign material may not be removed by normal cleaning equipment, it may have an adverse effect on milling and flour quality.
- **SHRUNKEN AND BROKEN KERNELS** are kernels that were insufficiently filled during growing and have a shrunken or shriveled appearance or were broken in handling. Such kernels may reduce milling yield.
- **TOTAL DEFECTS** is the sum of damaged kernels, foreign material and shrunken and broken kernels.
- **VITREOUS KERNELS** in hard red spring wheat are kernels that are uniformly dark and have no spots that appear chalky or soft. In durum, vitreous kernels have a glassy and translucent appearance without any spots that appear chalky.

WHEAT NON-GRADE TESTS

DOCKAGE is the percentage by weight of any material easily removed from a wheat sample using the Carter Dockage Tester. Dockage, because it can be removed, should not have any affect on milling quality but may have other economic effects for buyers. Grade factors are determined only after dockage is removed.

MOISTURE content is the percentage of water by weight of a sample and is an important indicator of profitability in milling. Flour millers add water to adjust wheat moisture to a standard level before milling. Lower wheat moisture allows more water to be added, increasing the weight of grain to be milled at virtually no cost. Moisture content is also an indicator of grain storability as wheat and flour with low moisture are more stable during storage. Because moisture can be readily added to or physically removed from a sample, other analysis results are often mathematically converted to a standard moisture basis (mb), such as 14%, 12% or dry matter, so results can be compared.

PROTEIN content is the percentage of protein by weight in a sample. Protein can be quickly and easily measured and therefore is an important factor in determining the value of wheat since it relates to many processing properties, such as water absorption and gluten strength. Low protein is desired for products such as snacks or cakes. High protein is desired for products such as pan breads, pasta, buns and frozen yeast-raised products.

ASH content is the percentage of minerals by weight in wheat or flour. In wheat, ash is primarily concentrated in the bran and is an indication of the flour yield that can be expected during milling. In flour, ash content indicates milling performance by indirectly revealing the amount of bran contamination in flour. Ash in flour can impart a darker color to finished products. Products requiring white flour call for low ash content, while whole wheat flour has higher ash content.

1000 KERNEL WEIGHT is the weight in grams of one thousand kernels of wheat and may indicate grain size and expected milling yield.

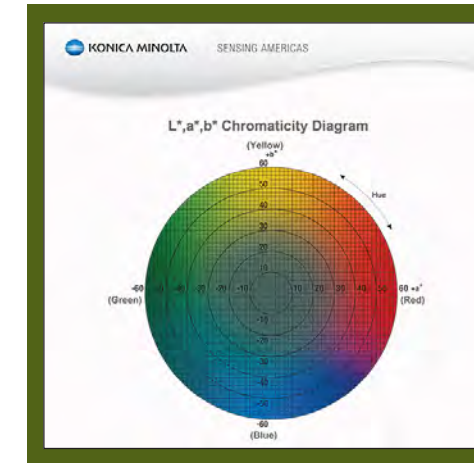
KERNEL SIZE is a measure of the percentage by weight of large, medium and small kernels in a sample. Large kernels or a more uniform kernel size may help improve milling yield.



Photo courtesy of Wheat Marketing Center

FALLING NUMBER indirectly indicates alpha-amylase activity, which results from sprout damage. High falling number values indicate low alpha-amylase activity. Sufficient alpha-amylase activity is required in flour for some products such as yeast-raised bread. However, excessive alpha-amylase in wheat cannot be removed and it is difficult to blend to a lower alpha-amylase content. The resulting flour produces a sticky dough that can cause problems during processing and products with poor color and weak texture. Falling number usually correlates closely with amylograph.

DON (DEOXYNIVALENOL) is a mycotoxin produced by fusarium fungi in grain.



COLOR is a numerical system to measure a sample's lightness (L^*) on a scale of 0 to 100 and "chromaticity" or hue on two scales each running from -60 to +60 for green-red (a^*) and blue-yellow (b^*). High L^* values indicate a bright color, and higher b^* values indicate more yellow. Flour color is influenced by the wheat's endosperm color particle size and the ash content of the flour and often affects the color of the finished product. Durum semolina color is heavily influenced by particle size.

FLOUR DATA

EXTRACTION is the percentage by weight of flour obtained from a wheat sample. In a commercial flour mill, the extraction rate is critically important to mill profitability. In a laboratory, milling with the Buhler laboratory mill is mainly done to obtain flour for other tests. The Buhler laboratory mill extraction rate is always significantly lower than the rate that can be obtained on a commercial mill, but may be useful for comparison between crop years.

WET GLUTEN is a measure of the quantity of gluten in wheat or flour samples as determined using the Glutomatic system. Gluten forms when water is added to the protein in wheat and is responsible for the elasticity and extensibility characteristics of flour dough.

GLUTEN INDEX is also determined by the Glutomatic system and is a measure of gluten strength regardless of the quantity of gluten present. Gluten index is used commercially to select durum samples with strong gluten characteristics. In

bread wheat, a variety of factors other than gluten quality can affect the results though very low gluten index may be an indication of protein damage from insect or disease activity.

AMYLOGRAPH measures flour starch pasting properties that are important to end products such as sheeted Asian noodles. Amylograph also measures enzyme (alpha-amylase) activity which results from sprout damage. Amylograph results usually correlate closely with falling number results.

STARCH DAMAGE is the percentage by weight of damaged starch in a flour sample, which is a measure of the physical damage done to starch granules during milling. Bread (hard) wheat flour typically has higher starch damage than soft wheat flour. Highly damaged starch readily absorbs more water, which affects dough mixing and other processing properties. Because starch damage depends on how the sample was

milled, starch damage is important for interpreting other results reported.

SOLVENT RETENTION CAPACITY (SRC) is the weight of solvent held by flour after centrifugation, expressed as a percent of the flour weight on a 14% mb. The results can be useful for predicting commercial baking performance, especially for low protein soft wheat flours. The different solvents used relate to the functionality of specific flour components as follows:

- **WATER** – Water absorption
- **SUCROSE** – Pentosans
- **LACTIC ACID** – Glutenins
- **SODIUM CARBONATE** – Damaged starch
- **GLUTEN PERFORMANCE INDEX (GPI)** – is defined as a ratio of three of the SRC values, lactic acid/(sodium carbonate + sucrose), and is a good predictor of overall performance of flour glutenins, especially for bread wheat flour.

EVALUATION OF END-PRODUCTS

BAKING ABSORPTION is the water required for optimum dough mixing performance, expressed as a percent of flour weight on a 14% mb.

CRUMB GRAIN AND TEXTURE is determined on a scale of 1 to 10 by visual comparison to a standard using a constant illumination source. Higher scores are preferred.

LOAF VOLUME is the volume of the test loaf after baking. Higher loaf volumes indicate better baking performance for pan breads.

SPECKS are small particles of bran or other material that escaped the wheat cleaning and semolina purifying process and thus depend on the milling process as well as the characteristics of the durum. Specks, which can detract from pasta appearance and desirability, are visually counted in a semolina sample and reported as the number in 10 square centimeters.

SUGAR SNAP COOKIE, SPONGE CAKE, CHINESE SOUTHERN-TYPE STEAMED BREAD, SPAGHETTI, AND HARD WHITE NOODLE AND STEAMED BREAD tests all use standardized methods to prepare specific end products to evaluate the suitability of the sample for that product or similar products. Details on many of these tests can be found in the Analysis Methods section of this booklet.

DOUGH PROPERTIES

FARINOGRAPH generates a curve that indicates the power used over time as flour and water are mixed into dough. The results describe the mixing properties of the dough and include:

- **PEAK TIME** is the time interval from the first addition of water to the maximum consistency immediately prior to the first indication of weakening. Long peak times indicate strong gluten and dough properties while short peak times may indicate weak gluten.
- **STABILITY** is the interval between the point where the top of the curve first intersects the 500-BU line (called the "arrival time") and the point where the top of the curve departs the 500-BU line ("departure time"). Long stability times also indicate strong gluten and dough properties, useful in products such as yeast-raised breads while short stability times indicate weaker gluten useful in many confectionary products.
- **ABSORPTION** is the amount of water (as a percent by weight of 14% moisture wheat flour) required to center the curve peak on the 500-BU line. High water absorption provides economic advantages for producing more dough pieces than flour with lower water absorption.

EXTENSOGRAPH generates a force-time curve for a piece of dough stretched until it breaks. Results include:

- **RESISTANCE**, measured at the maximum curve height in Brabender units (BU), reflects the maximum force applied and indicates the resistance of the dough to extension.
- **EXTENSIBILITY**, measured as the total length of the curve at the base line in centimeters, reflects how far the dough was stretched.
- **AREA** is the area under the curve reported in square centimeters.

These factors help describe the gluten strength and dough extensibility characteristics of flour for a wide range of end products. The extensograph can also evaluate the effects of fermentation time and additives on dough performance.

MIXOGRAPH generates a graph that records the force needed to mix flour or semolina and water into dough. The mixograph is similar to the farinograph but is quicker and uses a pin mixer and a smaller flour sample. Peak height and



Photo courtesy of Wheat Marketing Center

ALVEOGRAPH generates a curve indicating the air pressure necessary to inflate a piece of dough like a bubble to the point of rupture and indicates the gluten strength and extensibility of dough. Values reported include:

- **P** ("overpressure" or resistance), measured in millimeters to the maximum height of the curve, reflects the maximum pressure while blowing the bubble of dough and indicates dough resistance to extension.
- **L** (length), the length of the curve measured in millimeters, reflects the size of the bubble and indicates dough extensibility.
- **W** (the area under the curve) reflects the amount of energy needed to inflate the dough to the point of rupture and indicates dough strength.

The alveograph is well suited for measuring the dough characteristics of weaker gluten wheat and, with adaptive hydration and mix time, of stronger wheats including durum. Requirements differ depending on intended flour use. A low P value (indicating weak gluten) and long L value (high extensibility) are preferred for cakes and confectionery products; P/L close to 1 and high W values (strong gluten) are preferred for pan breads; and low P and long L values are favored for durum for pasta semolina.

peak time are common mixing parameters that are determined from mixogram.

- **CLASSIFICATION** indicates dough characteristics for durum milled fractions on a scale of 1 to 8 with higher values indicating stronger dough properties.
- **PEAK TIME** is the interval from the first addition of water to when the curve peaks and is considered an indicator of both the rate of dough development and hydration rate. Short peak time indicates a quick hydration rate and long peak time a slow hydration rate.
- **PEAK HEIGHT** is the height of the curve at peak time measured from the bottom of the mixogram paper to the middle of the band width at the curve peak. Peak height is primarily a function of

protein content, but is affected by water absorption and dough strength. Peak height increases with protein content and dough strength, decreases with water absorption and is measured in "Mixograph units (MU)". An MU is one rectangle on the mixogram.



Pan Bread

HARD RED WINTER

WEATHER AND HARVEST: Planted area for the 2017 hard red winter (HRW) crop fell to the lowest level in over 100 years, pressured by the poor income potential from wheat. The 2017 HRW production, estimated at 20.4 million metric tons (MMT), is down from 29.4 MMT in 2016 and well below the 5-year average. Large beginning stocks partially offset the sharp production decline. USDA estimated the HRW supply (excluding imports) at 36.5 MMT, down 13% from 2016. Variable conditions challenged the crop, but moisture remained adequate, or even excessive in some areas, resulting generally in better than expected yields, lower than average protein, but otherwise good milling and processing characteristics.

In the Southern and Central Plains, a warmer than normal winter favored diseases and insect pests. An unusually late 20-inch snowfall caused significant lodging in western Kansas, eastern Colorado and parts of Nebraska, Oklahoma and Texas. Higher disease and insect pressure followed and reduced yield potential. Late season rain benefited Kansas, Colorado and Nebraska, but was too late for Texas and Oklahoma.

The start of winter was mild and dry across the Pacific Northwest (PNW) and Northern Plains, but February through April was extremely wet with erratic temperatures. A hot, dry late spring caused inconsistent crop development. Eastern Montana, South Dakota and western North Dakota suffered severe drought conditions with devastating effects on yield.

WHEAT AND GRADE DATA: Overall kernel characteristics are outstanding in the 2017 crop, although protein levels were lower than average. Despite the challenging growing conditions, overall

92% of Composite, 86% of Gulf-Tributary and 100% of PNW-Tributary samples graded U.S. No. 2 or better. Test weight averages 60.5 lb/bu (79.6 kg/hl), above the 5-year average of 60.3 lb/bu (79.3 kg/hl) and equal to last year. The total defects average of 1.2% is below the 2016 and 5-year averages. Foreign material is 0.1%, below last year's 0.2%, while shrunken and broken at 0.9% is equal to last year and below the 5-year average. Average thousand kernel weight of 31.0 g significantly exceeds the 5-year average of 29.1 g. The average wheat falling number is 378 sec, below 2016 and the 5-year average, but still indicative of sound wheat.

The average protein of 11.4% (12% mb) is similar to last year, but significantly lower than the 5-year average. Protein content distribution varies by growing region. Approximately 56% of the samples tested were less than 11.5% protein, 28% between 11.5% to 12.5% and 16% greater than 12.5%.

FLOUR AND BAKING DATA: The Buhler laboratory mill flour yield average is 78.1%, above the 2016 average of 76.6% and the 5-year average of 75.2%. However, flour ash of 0.64% (14% mb) is also higher than 2016's 0.56% and the 5-year average. Gluten index values average 93%, equal to both last year and the 5-year average. The W value of 199 (10⁻⁴ J) is slightly lower than last year's average and well below the 5-year average. Average bake absorption is 62.8%, similar to 2016 and the 5-year average. Farinograph development and stability times are 4.5 min and 6.1 min, respectively, compared to last year's respective times of 4.0 min and 6.7 min and significantly lower than the 5-year averages. Loaf volume averages 806 cc, below 2016 and the 5-year average, but still indicative of good baking quality.

 **492**
SAMPLES

Collected from grain elevators in 44 reporting areas when at least 30% of the local harvest was complete.

USDA/ARS Hard Winter Wheat Quality Lab, Manhattan, KS, and Plains Grains, Inc. collected samples and conducted quality analyses.

Official grade and non-grade factors were determined on each sample. Functionality tests were conducted on 90 composite samples categorized by growing region and protein ranges of <11.5%, 11.5% to 12.5% and >12.5%. Production weighted results are presented as Composite, Gulf-tributary and PNW-tributary averages. Gulf-tributary states and PNW-tributary states are highlighted on the map on page 9. The methods are described in the Analysis Methods section of this booklet.

ABOUT HRW WHEAT

Medium to high protein, medium hard endosperm, red bran, medium gluten content, mellow gluten. Used in pan breads, Asian noodles, hearth breads, hard rolls, flatbreads, croissants and general-purpose flour.

SUMMARY: The quality of the 2017 HRW crop is very similar to the 2016 crop. Generally, the 2017 crop was planted and developed in a favorable environment until late in the growing season, with abundant moisture and no heat stress in the Central and Southern Plains. The lack of heat stress and relatively high yields resulted in lower quantities of wheat and flour protein, but the crop exhibits very good milling characteristics. The loaf volumes achieved indicate there is adequate protein quality to make good quality bread even though mix times are shorter than the 5-year averages. This crop meets or exceeds typical HRW contract specifications and should provide high value to customers.

CALIFORNIA HARVEST SURVEY

California's wheat growing regions are defined by climate, value of alternative crops and distinct differences in variety selection. Most California hard wheat is planted from October to January and harvested in June and July. With the strong demand for new crop

wheat in the domestic marketplace, importers are encouraged to express their interest in purchasing California wheat in early spring.

WEATHER AND HARVEST: After several years of drought, California received higher than average rainfall in 2017, and flooding was widespread in the Sacramento Valley growing area. Despite conditions favorable for stripe rust, most varieties have resistance, and there was little impact on yield or quality. Increased rainfall resulted in a larger than normal share of the crop having low protein content.

SUMMARY: California hard wheat varieties are known for their low moisture and large and uniform kernel size. Because wheat is predominantly grown under irrigation, growers achieve high yields and consistent quality. Overall, the 2017 crop has medium to high protein, though with an increased share of low protein. Consistent with other years, the 2017 crop has low moisture, high flour extraction and strong baking performance – all of which make California wheat suitable for blending.

159
SAMPLES

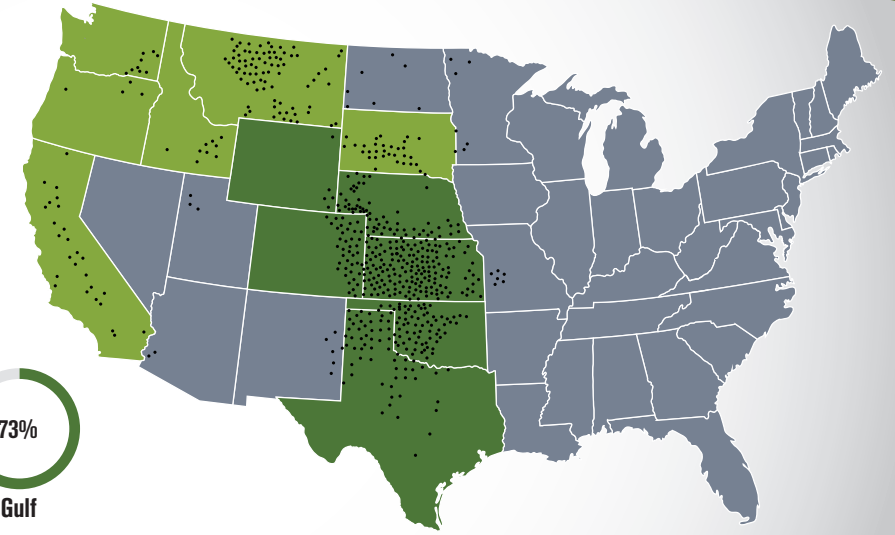
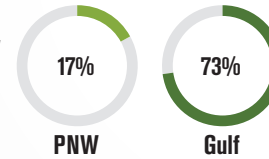
Collected from grain elevators during local harvest.

California Wheat Commission Laboratory and Federal Grain Inspection Service (FGIS) conducted tests and analyses.

Official grade and non-grade factors and functionality tests were determined on each sample. Results are weighted averages. The methods are described in the Analysis Methods section of this booklet.

12 STATES SURVEYED
90% OF TOTAL HRW PRODUCTION REPRESENTED

Percentage of total U.S. HRW production by export tributary region.



HARD RED WINTER PRODUCTION

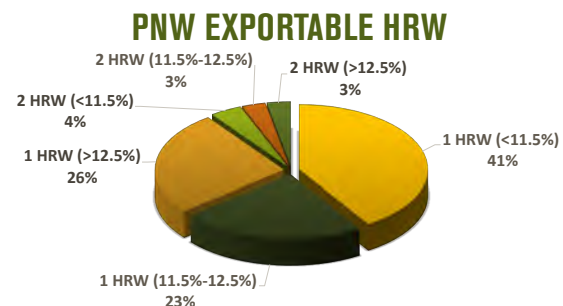
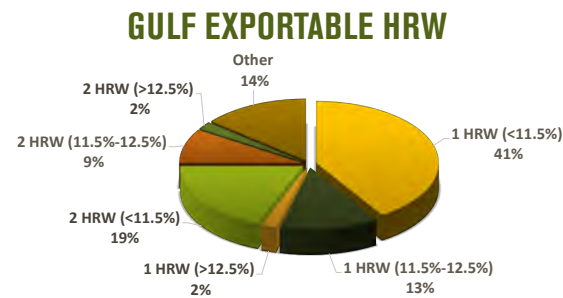
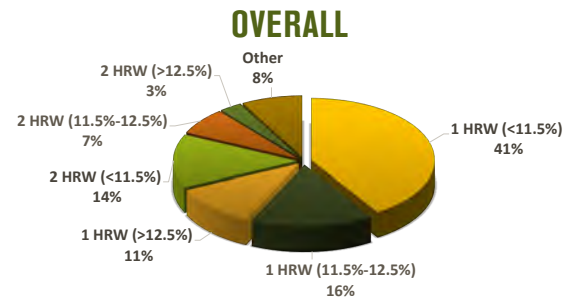
for the major producing states (million metric tons)

	2017	2016	2015	2014	2013
California	0.2	0.3	0.3	0.3	0.7
Colorado	2.1	2.7	2.1	2.3	1.1
Idaho	0.3	0.4	0.4	0.3	0.4
Kansas	8.8	12.3	8.5	6.5	8.6
Montana	1.8	2.9	2.5	2.5	2.2
Nebraska	1.2	1.8	1.2	1.9	1.1
Oklahoma	2.7	3.7	2.7	1.3	2.8
Oregon	0.1	0.1	0.0	0.1	0.1
South Dakota	0.6	1.7	1.2	1.6	0.7
Texas	1.7	2.4	2.7	1.7	1.7
Washington	0.5	0.5	0.3	0.3	0.4
Wyoming	0.1	0.1	0.1	0.1	0.1
Twelve-State Total	20.1	28.9	22.0	19.0	19.8
Total HRW Production	20.4	29.4	22.6	20.1	20.3

Based on USDA crop estimates as of September 29, 2017.

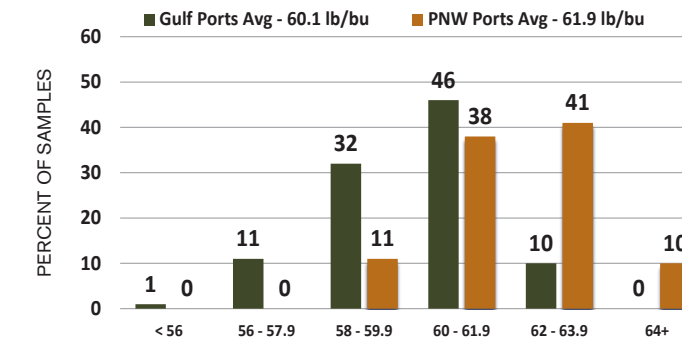
HRW GRADE DISTRIBUTIONS

(Values in parentheses denote protein level)



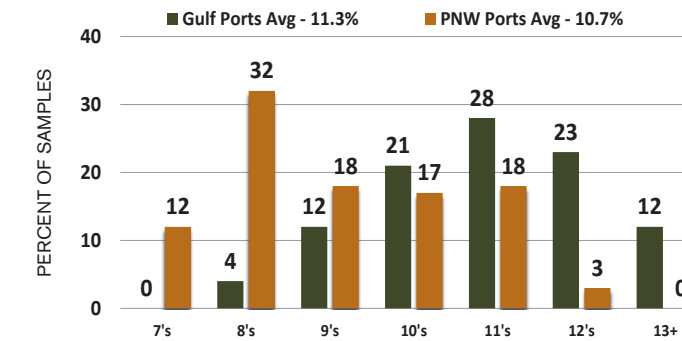
TEST WEIGHT

Pounds/Bushel



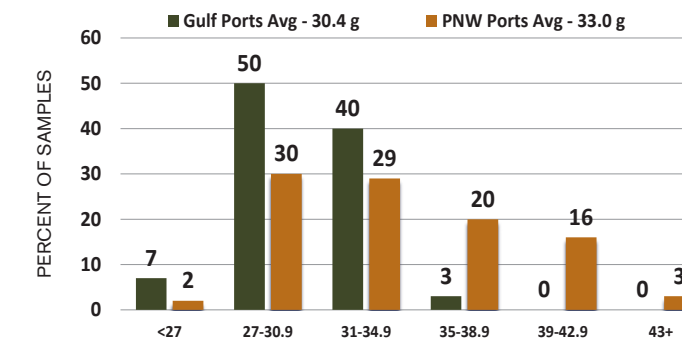
WHEAT MOISTURE

Percent



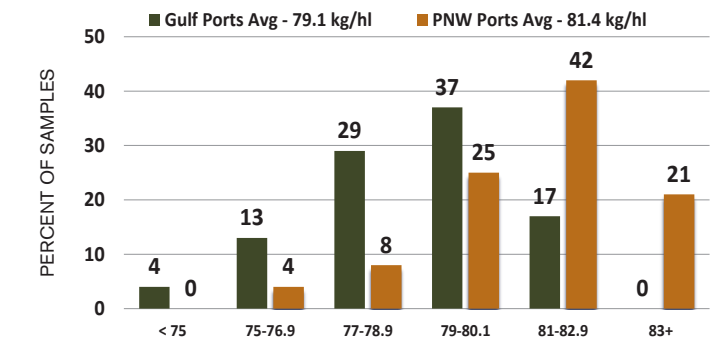
1000 KERNEL WEIGHT

Grams



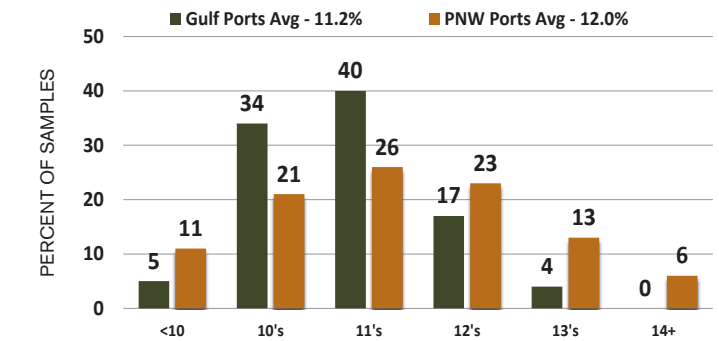
HECTOLITER WEIGHT

Kilograms/Hectoliter



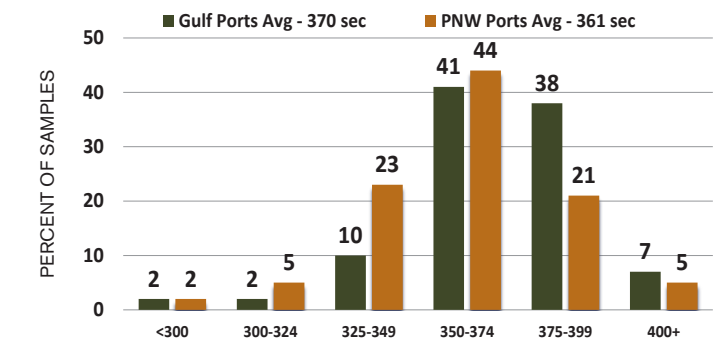
PROTEIN (12% MB)

Percent



FALLING NUMBER

Seconds



EXPORT CARGO SURVEY

The export cargo data represent 453 subplot samples provided by USDA's Federal Grain Inspection Service for crop years 2017 and 2016. Of 97 2017-crop samples collected in July and August, 43 are from Gulf and 54 from PNW ports. Of the 356 2016-crop samples, 240 are from Gulf and 116 from PNW ports. Grade data are the official grades on the individual sublots. Great Plains Analytical Laboratory conducted the milling and baking analyses.

HARD RED WINTER

MIDWEST AND PNW HARVEST DATA

HARD RED WINTER	COMPOSITE AVERAGE					
	2017 BY PROTEIN*			2016	5-YEAR	
	Low	Med	High	Overall	OVERALL	AVERAGE

WHEAT GRADE DATA:						
Test Weight (lb/bu)	60.8	60.2	59.1	60.5	60.5	60.3
(kg/hl)	80.0	79.2	77.7	79.6	79.6	79.3
Damaged Kernels (%)	0.2	0.2	0.2	0.2	0.3	0.3
Foreign Material (%)	0.1	0.2	0.1	0.1	0.2	0.1
Shrunken and Broken (%)	1.0	0.8	0.8	0.9	0.9	1.2
Total Defects (%)	1.3	1.2	1.1	1.2	1.4	1.6
Grade	1 HRW	1 HRW	1 HRW	1 HRW	1 HRW	1 HRW

WHEAT NON-GRADE DATA:						
Dockage (%)	0.6	0.6	0.6	0.6	0.5	0.6
Moisture (%)	11.3	10.8	10.3	11.0	11.2	11.2
Protein (%) 12%/0% moisture basis	10.7/12.2	11.9/13.5	13.1/14.8	11.4/13.0	11.5/13.1	12.6/14.4
Ash (%) 14%/0% moisture basis	1.49/1.73	1.51/1.75	1.54/1.79	1.50/1.74	1.49/1.73	1.53/1.78
1000 Kernel Weight (g)	31.1	31.0	31.0	31.0	31.7	29.4
Kernel Size (%) lg/md/sm	69/30/1	68/31/1	65/34/1	68/31/1	70/29/1	58/41/1
Single Kernel: Hardness	64.0	64.8	61.0	64.3	55.2	64.4
Weight (mg)	31.1	31.0	31.0	31.0	31.7	29.4
Diameter (mm)	2.56	2.55	2.54	2.56	2.66	2.60
Sedimentation (cc)	40.2	43.5	50.3	43.5	43.8	50.3
Falling Number (sec)	363	375	374	368	392	401
DON (ppm)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

FLOUR DATA:						
Lab Mill Extraction (%)	78.1	78.2	77.8	78.1	76.6	75.2
Color: L*	89.9	89.8	89.8	89.9	90.0	90.2
a*	-1.2	-1.1	-1.0	-1.1	-1.2	-1.5
b*	10.3	10.3	10.2	10.3	10.3	10.2
Protein (%) 14%/0% moisture basis	9.9/11.6	11.0/12.8	12.1/14.1	10.7/12.4	10.4/12.0	11.6/13.5
Ash (%) 14%/0% moisture basis	0.63/0.73	0.63/0.74	0.66/0.77	0.64/0.74	0.56/0.65	0.56/0.65
Wet Gluten (%)	22.8	26.6	30.1	25.3	24.8	29.2
Gluten Index	95	92	88	93	93	93
Falling Number (sec)	394	412	416	401	431	417
Amylograph Viscosity: 65g (BU)	463	478	517	478	491	505
Starch Damage (%)	6.9	6.9	6.8	6.8	6.4	6.3
SRC: GPI	0.60	0.57	0.58	0.58	0.66	
Water / 50% Sucrose	70/105	67/108	70/113	69/109	72/114	
5% Lactic Acid / 5% Na ₂ CO ₃	122/97	117/97	122/97	120/97	146/103	

DOUGH PROPERTIES:						
Farinograph: Peak Time (min)	4.1	4.6	5.0	4.5	4.0	5.2
Stability (min)	6.0	5.7	6.1	6.1	6.7	9.2
Absorption (%)	59.5	60.9	63.1	60.5	59.2	59.5
Alveograph: P (mm)	87	87	97	88	91	80
L (mm)	64	74	79	70	69	95
P/L Ratio	1.36	1.18	1.23	1.26	1.33	0.84
W (10 ⁻⁴ J)	184	203	230	199	211	239
Extensograph: Resistance (BU)	304/471	273/424	277/422	293/449	324/503	322/476
(45/135 min) Extensibility (cm)	13.3/12.3	14.4/13.6	14.3/14.3	13.8/13.0	13.6/12.8	14.7/14.2
Area (cm ²)	67/87	67/93	66/99	67/92	74/100	83/114

BAKING EVALUATION:						
Pan Bread: Bake Absorption (%)	62.2	63.1	64.0	62.8	62.9	62.7
Crumb Grain and Texture (1-10)	6.3	6.8	6.6	6.6	5.5	6.2
Loaf Volume (cc)	783	824	840	806	821	840

PRODUCTION OF 11 STATES (%):	55	26	19	100		
------------------------------	----	----	----	-----	--	--

*Protein Range: Low, <11.5%; Med, 11.5 - 12.5%; High, >12.5%.



Instant Noodles

HARD RED WINTER

MIDWEST AND PNW HARVEST DATA

GULF EXPORTABLE AVERAGE	COMPOSITE AVERAGE						PNW EXPORTABLE AVERAGE					
	2017 BY PROTEIN*			2016	5-YEAR		2017 BY PROTEIN*			2016	5-YEAR	
	Low	Med	High	Overall	OVERALL	AVERAGE	Low	Med	High	Overall	OVERALL	AVERAGE

60.6	59.7	58.3	60.1	60.4	60.0	61.7	62.1	61.9	61.9	60.8	60.9
79.7	78.5	76.7	79.1	79.5	79.0	81.1	81.7	81.4	81.4	80.0	80.1
0.2	0.2	0.2	0.2	0.3	0.3	0.1	0.0	0.0	0.0	0.2	0.2
0.1	0.2	0.1	0.1	0.2	0.2	0.1	0.0	0.1	0.1	0.2	0.1
1.0	0.9	0.7	0.9	0.9	1.2	1.0	0.6	1.0	0.9	0.9	1.0
1.3	1.3	1.0	1.2	1.3	1.7	1.2	0.6	1.1	1.0	1.1	1.3
1 HRW	1 HRW	1 HRW	1 HRW	1 HRW	1 HRW	1 HRW	1 HRW	1 HRW	1 HRW	1 HRW	1 HRW

0.6	0.7	0.7	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.7	0.6
11.6	11.1	10.4	11.3	11.4	11.4	10.4	9.6	10.0	10.0	10.6	10.7
10.7/12.2	11.9/13.5	13.0/14.7	11.2/12.8	11.4/13.0	12.8/14.5	10.6/12.1	12.0/13.6	13.4/15.2	12.0/13.6	11.7/13.3	12.2/13.9
1.50/1.75	1.54/1.79	1.56/1.81	1.52/1.76	1.48/1.72	1.55/1.79	1.44/1.68	1.40/1.63	1.46/1.70	1.43/1.67	1.52/1.76	1.49/1.73
30.6	30.1	30.6	30.4	31.7	28.7	32.7	34.2	32.2	33.0	31.6	31.4
69/30/1	67/32/1	68/31/1	68/31/1	71/28/1	55/43/1	71/28/1	72/27/1	54/45/1	66/33/1	66/33/1	66/33/1
63.5	63.7	58.6	63.2	54.3	64.5	65.9	68.8	69.6	68.1	58.4	64.2
30.6	30.1	30.6	30.4	31.7	28.7	32.7	34.2	32.2	33.0	31.6	31.4
2.55	2.53	2.53	2.55	2.65	2.57	2.60	2.64	2.56	2.60	2.71	2.67
39.6	42.8	48.2	41.3	41.4	49.4	42.4	46.0	57.6	51.2	51.8	53.6
365	381	374	370	396	403	357	356	371	361	378	396
<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

78.8	78.9	78.5	78.8	77.0	75.2	75.7	75.9	75.3	75.6	75.2	74.9
89.9	89.7	89.7	89.9	89.9	90.1	90.1	90.1	90.0	90.1	90.3	90.6
-1.2	-1.1	-1.0	-1.1	-1.2	-1.4	-1.1	-1.1	-1.0	-1.0	-1.1	-1.5
10.3	10.3	10.2	10.3	10.5	10.3	10.1	10.3	10.1	10.2	9.9	9.9
9.9/11.5	11.0/12.8	12.0/13.9	10.4/12.1	10.4/12.1	11.8/13.7	10.1/11.8	11.0/12.8	12.6/14.6	11.6/13.5	10.6/12.4	11.1/12.9
0.64/0.74	0.65/0.76	0.68/0.79	0.65/0.75	0.58/0.67	0.58/0.68	0.61/0.71	0.58/0.68	0.58/0.68	0.59/0.69	0.50/0.59	0.50/0.59
22.8	26.9	29.8	24.6	24.7	30.0	23.0	25.7	31.2	27.9	25.0	27.1
95	91	87	93	92	92	97	94	92	94	97	96
392	412	419	400	436	419	403	412	404	406	417	411
464	481	518	474	489	498	459	467	514	490	497	525
6.8	6.8	6.8	6.8	6.4	6.3	7.2	7.1	6.8	7.0	6.5	6.3
0.60	0.57	0.57	0.58	0.64		0.62	0.57	0.62	0.61	0.72	
68/104	67/110	70/112	68/108	72/115		76/112	68/105	71/118	72/111	73/109	
118/93	118/97	118/96	118/96	141/104		137/108	115/98	137/102	130/103	156/107	

4.2	4.5	4.6	4.3	3.9	5.3	3.9	5.1	6.2	5.4	4.3	5.0
5.9	5.3	5.5	5.7	6.5	9.1	6.2	7.3	8.4	7.5	7.3	9.7
59.2	60.7	63.0	60.0	59.2	60.0	60.6	61.6	63.6	62.4	59.2	58.7
83	84	95	84	89	80	100	99	102	101	96	82
66	76	79	70	67	95	55	68	77	69	74	95
1.26	1.11	1.20	1.20	1.33	0.84	1.82	1.46	1.32	1.46	1.30	0.86
178	194	220	187	199	231	203	233	267	243	252	262
293/450	260/407	260/403	281/433	304/489	306/451	345/545	321/483	338/491	337/505	390/549	371/550
13.5/12.5	14.7/13.9	14.4/14.5	13.9/13.1	13.4/12.6	14.7/14.4	12.7/11.4	13.4/12.5	13.9/13.4	13.5/12.7	14.4/13.3	14.7/13.8
66/87	65/93	62/97	65/90	67/94	78/110	70/88	73/95	78/107	75/100	97/119	97/128

62.1	63.0	63.8	62.5	62.6	62.6	62.6	63.3	64.5	63.8	63.9	62.9
6.3	6.8	6.4	6.5	5.4	6.1	6.1	6.9	7.2	6.8	5.7	6.4
783	833	837	802	819	844	782	794	850	821	829	828

PRODUCTION OF 11 STATES (%):	49	22	7	78	6	4	12	22			
------------------------------	----	----	---	----	---	---	----	----	--	--	--

*Protein Range: Low, <11.5%; Med, 11.5 - 12.5%; High, >12.5%.

HARD RED WINTER

CALIFORNIA AND EXPORT DATA

HARD RED WINTER	CALIFORNIA HARVEST DATA				EXPORT CARGO DATA			
	MEDIUM PROTEIN*		HIGH PROTEIN*		GULF		PNW	
	2017	2016	2017	2016	2017	2016	2017	2016
WHEAT GRADE DATA:								
Test Weight (lb/bu)	63.3	63.4	62.1	64.1	60.6	60.1	62.7	61.9
(kg/hl)	83.2	83.4	81.7	84.3	79.8	79.0	82.4	81.4
Damaged Kernels (%)	0.0	0.1	0.1	0.2	0.9	0.9	0.1	0.2
Foreign Material (%)	0.1	0.4	0.1	0.4	0.2	0.2	0.1	0.0
Shrunken and Broken (%)	0.7	0.6	1.0	1.0	1.3	1.4	1.0	1.2
Total Defects (%)	0.8	0.9	1.2	1.6	2.4	2.5	1.1	1.4
Grade	1 HRW	1 HRW	1 HRW	1 HRW	1 HRW	1 HRW	1 HRW	1 HRW
WHEAT NON-GRADE DATA:								
Dockage (%)	1.0	1.0	0.9	1.3	0.6	0.6	0.3	0.3
Moisture (%)	10.0	8.2	8.2	8.2	11.2	11.1	9.7	10.3
Protein (%) 12%/0% moisture basis	11.8/13.4	11.9/13.5	13.1/14.9	13.5/15.3	11.4/13.0	11.5/13.1	11.6/13.2	11.8/13.5
Ash (%) 14%/0% moisture basis	1.54/1.79	1.39/1.61	1.53/1.78	1.46/1.70	1.48/1.72	1.47/1.71	1.33/1.55	1.36/1.58
1000 Kernel Weight (g)	41.5	40.9	42.4	40.0	28.2	28.1	30.6	29.7
Kernel Size (%) lg/md/sm	85/15/0	89/11/0	83/16/1	86/13/1	68/31/1	68/30/2	68/31/1	66/33/1
Single Kernel: Hardness	71.0	63.0	62.8	67.7		64.7		68.4
Weight (mg)	41.7	40.9	41.8	40.0		32.0		33.1
Diameter (mm)	2.98	2.96	2.96	2.97		2.60		2.62
Sedimentation (cc)	44.4	51.0	46.6	61.9	29.3	29.6	40.1	41.8
Falling Number (sec)	369	370	452	421	420	415	404	404
DON (ppm)	<0.5	<0.5	<0.5	<0.5		<0.5		<0.5
FLOUR DATA:								
Lab Mill Extraction (%)	66.3	70.5	68.2	70.2	66.6	68.8	66.9	69.1
Color: L*	93.6	93.1	93.0	93.0	90.0	89.6	90.0	89.8
a*	-1.0	-0.8	-1.0	-0.7	-2.1	-2.0	-2.1	-2.0
b*	7.1	7.2	7.9	7.8	9.6	9.3	9.4	9.0
Protein (%) 14%/0% moisture basis	11.0/12.7	10.8/12.6	11.7/13.6	12.3/14.3	9.9/11.6	10.0/11.6	10.4/12.0	10.5/12.2
Ash (%) 14%/0% moisture basis	0.41/0.47	0.41/0.48	0.43/0.50	0.37/0.43	0.46/0.53	0.47/0.54	0.44/0.51	0.46/0.54
Wet Gluten (%)	32.6	30.0	35.4	35.2	26.1	26.4	27.3	27.7
Gluten Index	63	92	77	89	96	97	97	98
Falling Number (sec)	375	383	509	379	418	439	403	430
Amylograph Viscosity: 65g (BU)	795	672	986	809	721	694	678	643
Starch Damage (%)	9.5	8.7	9.1	8.3				
SRC: GPI	0.79	0.69	0.82	0.74				
Water / 50% Sucrose	69/105	71/114	70/108	75/118				
5% Lactic Acid / 5% Na ₂ CO ₃	149/84	144/96	158/84	158/97				
DOUGH PROPERTIES:								
Farinograph: Peak Time (min)	4.7	7.0	9.6	15.0	6.3	6.3	6.7	6.7
Stability (min)	11.0	12.2	15.2	17.0	13.9	12.6	14.1	13.7
Absorption (%)	64.0	63.3	65.0	67.5	58.6	59.0	60.8	60.4
Alveograph: P (mm)	125	108	128	123	96	105	114	113
L (mm)	75	93	89	100	88	92	83	96
P/L Ratio	1.67	1.26	1.22	1.27	1.08	1.14	1.37	1.18
W (10 ⁻⁴ J)	363	310	394	399	279	310	326	358
Extensograph: Resistance (BU)	234/400	266/329	334/475	310/502				
(45/135 min) Extensibility (cm)	17.7/15.8	17.7/18.0	15.8/14.8	16.8/15.0				
Area (cm ²)	89/119	107/133	102/132	114/139				
BAKING EVALUATION:								
Pan Bread: Bake Absorption (%)	64.0	64.6	64.0	68.0				
Crumb Grain and Texture (1-10)	8.0	8.0	9.0	9.0	6.8	6.7	6.8	6.8
Loaf Volume (cc)	891	900	948	986	875	864	861	882
SAMPLE COUNT:								
	43	240	54	116				

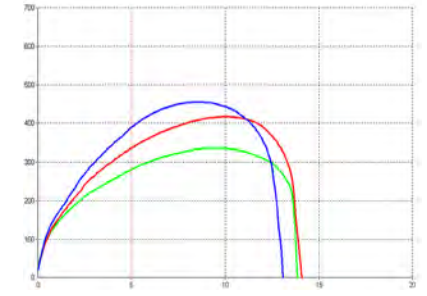
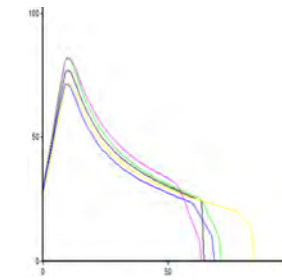
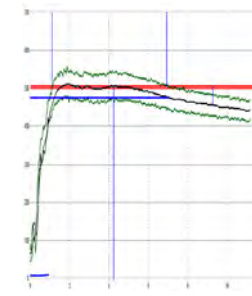
*California HRW Protein Range: Med, 11.0 - 12.5%; High, >12.5%.

FARINOGRAMS*

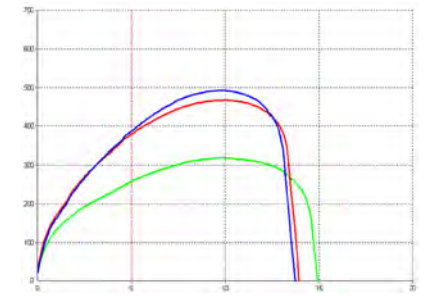
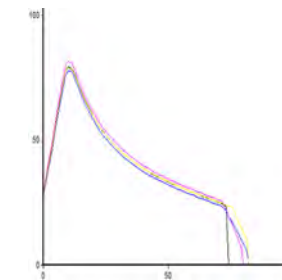
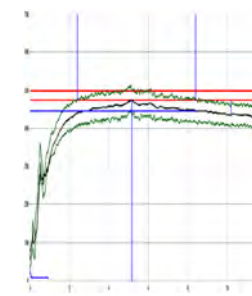
ALVEOGRAMS*

EXTENSOGRAMS*

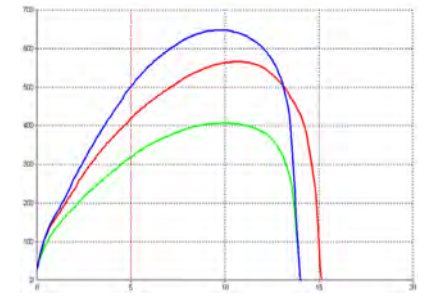
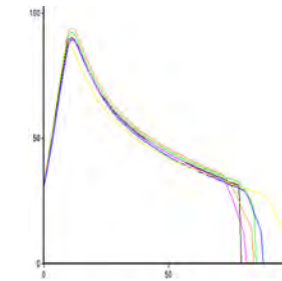
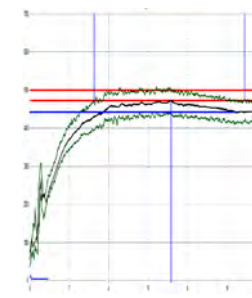
LOW
PROTEIN



MEDIUM
PROTEIN



HIGH
PROTEIN



*Representing 2017 Composite Average



Hard Rolls



Bagels

HARD RED SPRING

WEATHER AND HARVEST: Planting began in early April, near normal, with adequate soil moisture in most areas. Cool soil temperatures hindered progress initially, but warm, dry conditions allowed progress to accelerate into mid-May. Planting was 95% complete by the end of May, slightly ahead of normal.

Dry soil conditions and well below normal rainfall affected Montana and western North and South Dakota with much of that area in moderate to severe drought during June and July. Yield prospects fell well below normal, and a greater than normal share of planted acres was abandoned for forage. However, quality impacts were minimal.

In contrast, the Pacific Northwest, Minnesota and eastern parts of North and South Dakota benefitted from timely and more abundant precipitation, resulting in above-average to record yields. Disease pressure was nearly non-existent due to drier than normal weather in many areas.

Harvest began in late July and progressed steadily due to generally dry conditions. Mid-August rains had minimal crop impact. Harvest was largely complete by mid-September, slightly ahead of normal.

The 2017 HRS production, estimated at 10.5 million metric tons (MMT), is down from 13.4 MMT in 2016 and is well below the 5-year average. USDA estimates that the total 2017/18 HRS supply (excluding imports) is down 19% from 2016/17 due to smaller production and beginning stocks.

WHEAT AND GRADE DATA: The average grade is U.S. No. 1 NS; 97% of Eastern Region samples and 83% of Western Region samples graded U.S. No. 1. The overall average test weight is 61.6 lb/bu (81 kg/hl), similar to the 5-year average, though the Western Region average is lower due to drought. Eighty-eight percent of Eastern samples are above 60 lb/bu (78.9 kg/hl)

compared to just 66% of Western samples. Average damage is 0.0%, but shrunken and broken kernels are 0.9%, slightly higher than 2016. Average vitreous kernel content (DHV) is 73%, compared to 85% a year ago. Average DHV for Western samples is 82% compared to just 62% for Eastern.

The average protein is 14.6% (12% mb), higher than both 2016 and the 5-year average; the Western crop has a greater year-to-year increase. Western average protein is 14.9%, while Eastern average protein is 14.4%. More than one-half of all samples have greater than 14.5% protein in 2017 compared to just 36% in 2016. The Eastern protein distribution is more balanced with 30% falling below 13.5% protein.

Kernel moisture is low, averaging 12.0%, but varies from 11.2% for the Western crop to 12.7% for the Eastern. The average falling number is 383 sec, indicating sound wheat. Only 2% of the crop falls below 300 sec. Minimal disease pressure kept DON levels nearly non-existent except for a small number of Eastern samples. The crop's overall DON average is less than 0.5 ppm. Thousand kernel weight (TKW) is slightly lower than 2016 and the 5-year average; TKW averages 32.9 g in the Eastern samples but just 28.7 g in the Western.

FLOUR, DOUGH AND BAKING DATA: Buhler laboratory mill flour yield averages 71.2%, up sharply from 2016 and the 5-year averages; both the Western and Eastern crops have improved extractions. Flour ash is also higher at 0.58%, compared to just 0.49% in 2016 and the 5-year average of 0.50%. Wet gluten averages 35.8%, up from recent years. Amylograph values average 588 BU for 65 g of flour, slightly lower than 2016 and the 5-year average, with the highest protein segments of the crop having the lowest values in both regions.

799
SAMPLES

Collected from fields, on-farm bin sites or elevators, and separated by export region.

The HRS Wheat Quality Lab, Department of Plant Sciences, North Dakota State University (NDSU), Fargo, ND, collected samples and conducted quality analyses.

Official grade and non-grade factors were determined on 60% of samples. Functionality tests were conducted on 24 composite samples categorized by export region and protein ranges of <13.5%, 13.5% to 14.5% and >14.5%. Production-weighted results are presented as Composite, Eastern and Western Region averages based on composite samples. Eastern and Western Region states are highlighted on the map on page 16. The methods are described in the Analysis Methods section of this booklet.

ABOUT HRS WHEAT

Highest protein content, hard endosperm, red bran, strong gluten, high water absorption. Used in pan breads, hearth breads, rolls, croissants, bagels, hamburger buns, pizza crust and for blending.

Farinograph dough properties are slightly weaker compared to 2016 with similar absorption. Average farinograph stability is 10.7 min, down from 12.2 in 2016 but similar to the 5-year average. The Eastern crop has slightly stronger dough properties relative to the Western area, but dough strength increases at higher protein levels in both areas. The average farinograph absorption is 63%, with slightly higher absorptions noted in the Western crop.

The extensograph shows less resistance and greater extensibility compared with

2016 and the 5-year average. The average alveograph W-value is 360 (10⁻⁴ J) compared with 394 in 2016 and the 5-year average of 362.

The average loaf volume is 968 cc and average bake absorption is 67.1%, both of which are lower than 2016. Dough handling properties are showing greater extensibility this year relative to 2016, especially in the Western region and may require adjustments for end users. Bread scores are higher in 2017 in both Western and Eastern crops.

SUMMARY: The smaller 2017 HRS crop has many positive attributes, including high grades, plentiful protein, little to no DON and very good functional performance. Some variance in rotein levels, shrunken and broken kernels, thousand kernel weights and functional performance does exist due to the vast differences in growing conditions across the region. Diligent contract specifications are still encouraged on this high quality crop to ensure buyers get the quality expected.

HARD RED SPRING PRODUCTION

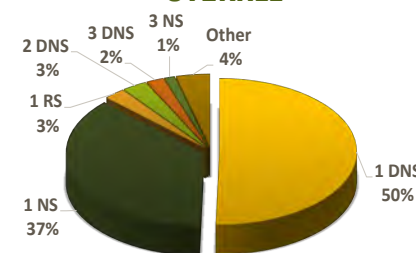
for the major producing states (million metric tons)

	2017	2016	2015	2014	2013
Idaho	0.5	0.4	0.4	0.4	0.5
Minnesota	2.1	2.0	2.3	1.8	1.8
Montana	1.3	2.1	2.1	2.9	2.8
North Dakota	5.7	7.3	8.7	8.0	6.4
Oregon	0.1	0.0	0.0	0.0	0.1
South Dakota	0.6	1.3	1.6	1.9	1.4
Washington	0.3	0.3	0.2	0.2	0.3
Seven-State Total	10.5	13.4	15.4	15.1	13.3
Total HRS Production	10.5	13.4	15.4	15.1	13.4

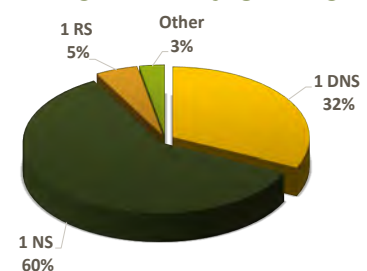
Based on USDA crop estimates as of September 29, 2017.

HRS GRADE DISTRIBUTIONS

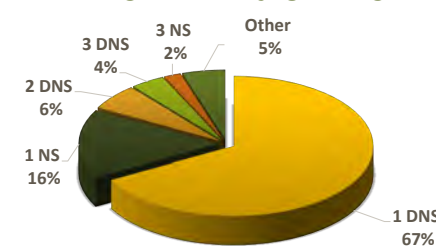
OVERALL



EASTERN REGION HRS



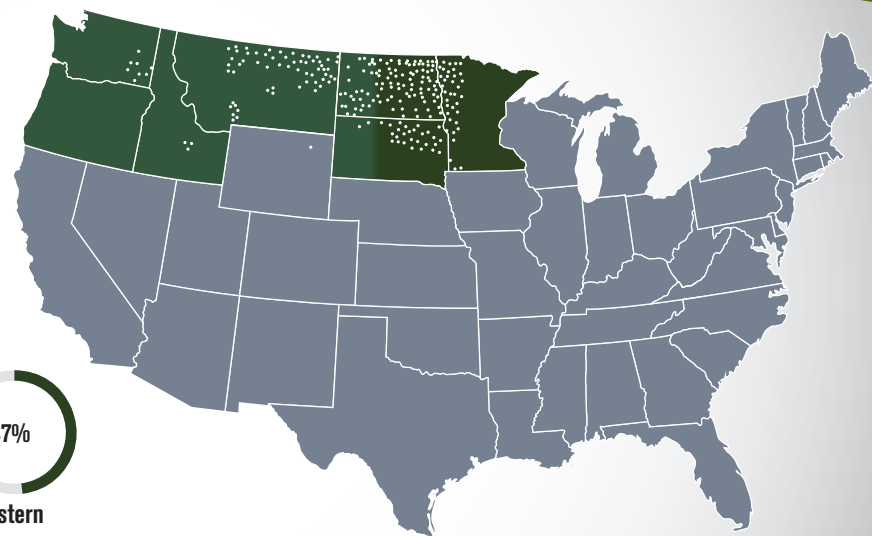
WESTERN REGION HRS



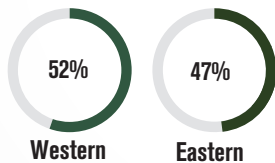
EXPORT CARGO SURVEY

The export cargo data represent 490 individual subplot samples provided by USDA's Federal Grain Inspection Service for crop years 2016 (collected from October 2016 through June 2017) and 2015. Of 241 2016-crop samples, 197 were from the PNW, 16 from Gulf ports and 28 from Great Lakes ports. Grade data are the official grades on the individual subplots. North Dakota State University conducted the milling and baking analyses.

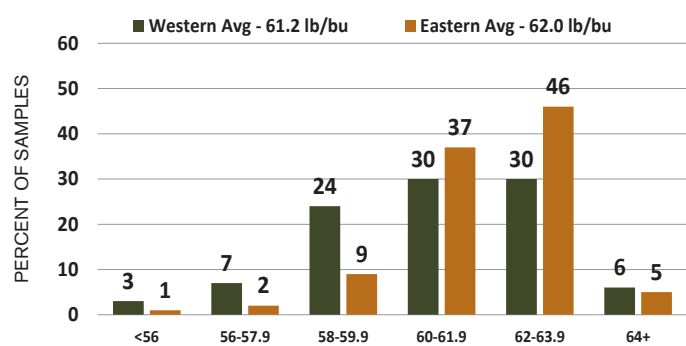
7 STATES SURVEYED
99%
OF TOTAL HRS PRODUCTION REPRESENTED



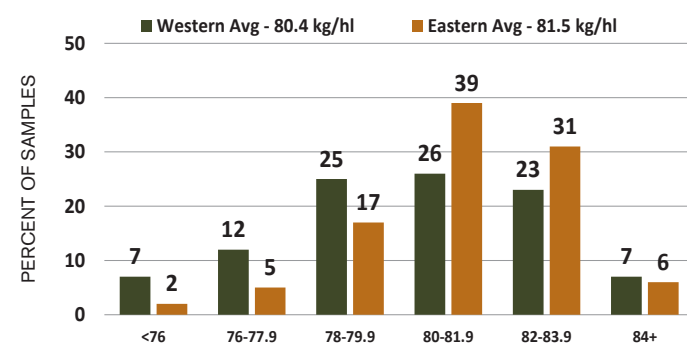
Percentage of total U.S. HRS production by region.



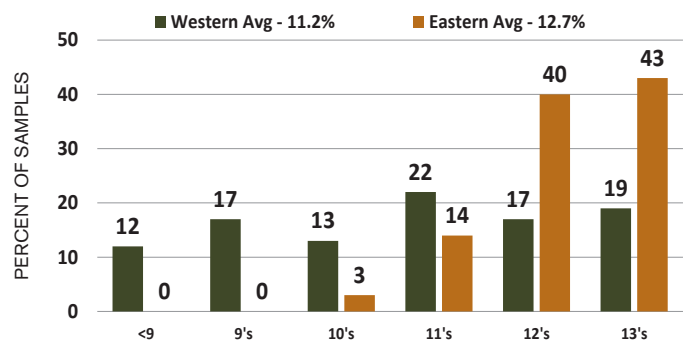
TEST WEIGHT Pounds/Bushel



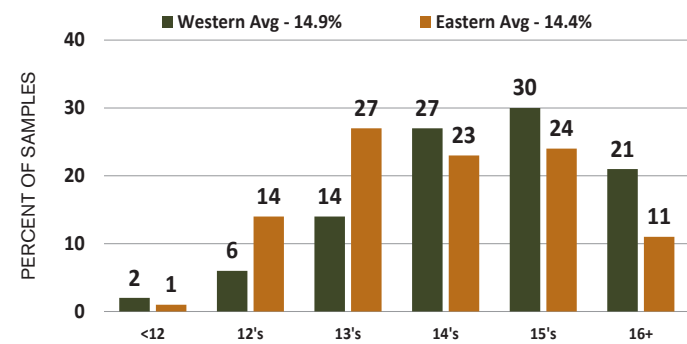
HECTOLITER WEIGHT Kilograms/Hectoliter



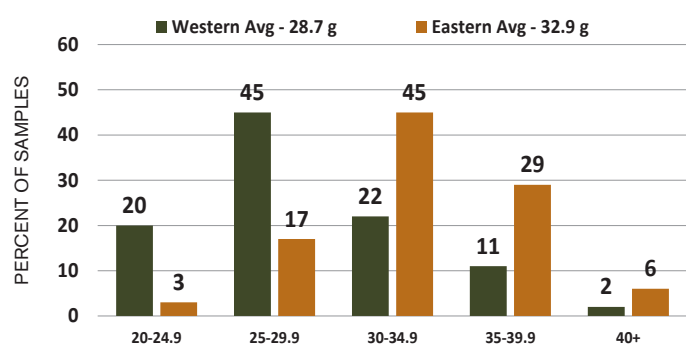
WHEAT MOISTURE Percent



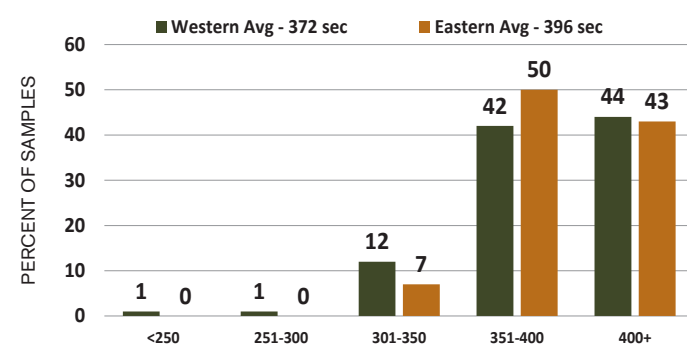
PROTEIN (12% MB) Percent



1000 KERNEL WEIGHT Grams



FALLING NUMBER Seconds

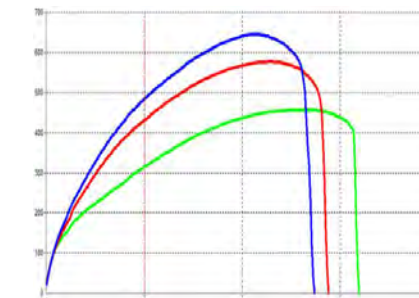
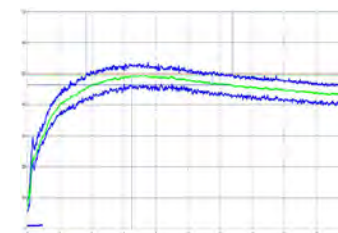


FARINOGRAMS*

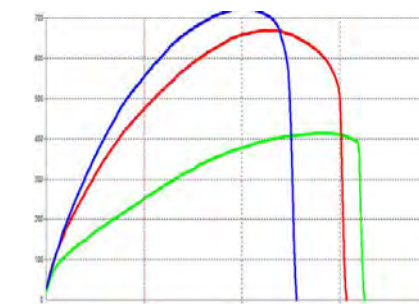
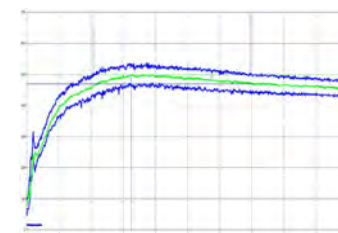
ALVEOGRAMS*

EXTENSOGRAMS*

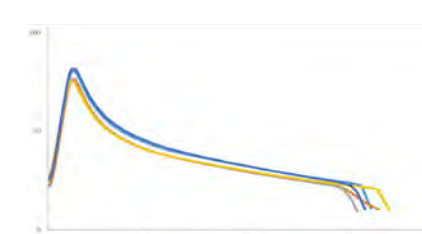
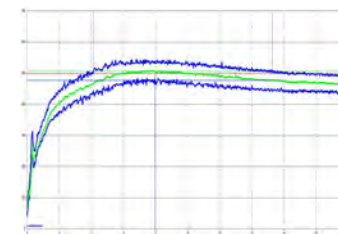
LOW PROTEIN



MEDIUM PROTEIN



HIGH PROTEIN



*Representing 2017 Composite Average



Croissants

HARD RED SPRING

HARVEST DATA

HARD RED SPRING	COMPOSITE AVERAGE					
	2017 BY PROTEIN*			2016	5-YEAR	
	Low	Med	High	Overall	Overall	Average
WHEAT GRADE DATA:						
Test Weight (lb/bu)	62.9	62.4	60.7	61.6	61.6	61.6
(kg/hl)	82.7	82.0	79.8	81.0	81.0	81.0
Damaged Kernels (%)	0.0	0.0	0.0	0.0	0.1	0.1
Foreign Material (%)	0.0	0.0	0.0	0.0	0.0	0.0
Shrunken & Broken (%)	0.8	0.8	0.9	0.9	0.8	1.0
Total Defects (%)	0.8	0.8	0.9	0.9	0.9	1.1
Vitreous Kernels (%)	62	71	77	73	85	71
Grade	1 NS	1 NS	1 DNS	1 NS	1 DNS	1 NS
WHEAT NON-GRADE DATA:						
Dockage (%)	0.5	0.3	0.5	0.5	0.5	0.6
Moisture (%)	12.2	12.0	11.9	12.0	12.0	12.1
Protein (%) 12%/0% moisture basis	13.0/14.7	14.1/16.0	15.5/17.6	14.6/16.6	14.1/16.0	14.0/15.9
Ash (%) 14%/0% moisture basis	1.53/1.78	1.50/1.74	1.51/1.76	1.51/1.76	1.50/1.75	1.52/1.76
1000 Kernel Weight (g)	34.1	31.5	29.0	30.7	30.9	31.1
Kernel Size (%) lg/md/sm	53/45/2	47/50/3	29/66/5	38/58/4	43/54/3	47/50/3
Single Kernel: Hardness	82	80	80	80	78	82
Weight (mg)	34.2	34.3	30.3	32.1	32.1	32.6
Diameter (mm)	2.45	2.42	2.21	2.31	2.34	2.37
Sedimentation (cc)	60.3	66.0	67.0	65.7	64.3	62.3
Falling Number (sec)	369	411	377	383	378	381
DON (ppm)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
FLOUR DATA:						
Lab Mill Extraction (%)	72.0	72.5	70.4	71.2	66.8	67.8
Color: L*	90.3	90.2	89.8	90.0	90.9	90.8
a*	-1.0	-1.0	-1.0	-1.0	-1.1	-1.1
b*	9.4	9.6	9.9	9.7	9.6	9.5
Protein (%) 14%/0% moisture basis	12.0/14.0	13.4/15.6	14.8/17.2	13.9/16.1	13.0/15.1	12.9/15.0
Ash (%) 14%/0% moisture basis	0.56/0.65	0.58/0.67	0.59/0.68	0.58/0.67	0.49/0.57	0.50/0.58
Wet Gluten (%)	29.9	33.9	38.9	35.8	33.6	34.2
Gluten Index	97	94	86	90	94	92
Falling Number (sec)	392	418	406	406	392	395
Amylograph Viscosity: 65g (BU)	623	654	547	588	667	637
Starch Damage (%)	6.7	7.4	6.7	6.8	7.1	7.2
SRC: GPI	0.64	0.65	0.67	0.66	0.66	0.66
Water / 50% Sucrose	70/113	71/117	70/118	70/117	69/118	73/126
5% Lactic Acid / 5% Na ₂ CO ₃	136/99	142/100	143/95	141/97	144/98	149/102
DOUGH PROPERTIES:						
Farinograph: Peak Time (min)	6.6	6.9	8.1	7.5	8.1	7.1
Stability (min)	9.4	9.8	11.6	10.7	12.2	11.3
Absorption (%)	61.2	62.6	63.9	63.0	63.0	63.0
Alveograph: P (mm)	79	78	78	78	83	91
L (mm)	119	149	148	142	140	118
P/L Ratio	0.67	0.52	0.52	0.55	0.59	0.78
W (10 ⁻⁴ J)	317	363	375	360	394	362
Extensograph: Resistance (BU)	451/656	480/782	472/809	469/770	524/1003	461/768
(45/135 min) Extensibility (cm)	15.9/13.4	15.8/13.6	16.9/13.5	16.4/13.5	16.5/11.9	16.7/13.7
Area (cm ²)	96/115	98/141	104/145	101/137	112/156	100/135
BAKING EVALUATION:						
Pan Bread: Bake Absorption (%)	64.2	66.5	68.5	67.1	69.3	64.9
Crumb Grain and Texture (1-10)	8.0	8.0	8.3	8.2	7.9	7.9
Loaf Volume (cc)	868	931	1022	968	986	973
PRODUCTION OF 7 STATES (%):						
	22	23	55	100		

*Protein Range: Low, <13.5%; Med, 13.5 to 14.5%; High, >14.5%.

HARD RED SPRING

HARVEST DATA

WESTERN REGIONAL AVERAGE						EASTERN REGIONAL AVERAGE					
2017 BY PROTEIN*			2016	5-YEAR		2017 BY PROTEIN*			2016	5-YEAR	
Low	Med	High	Overall	Overall	Average	Low	Med	High	Overall	Overall	Average
WHEAT GRADE DATA:											
62.9	62.2	60.5	61.2	61.8	61.4	62.9	62.6	61.1	62.0	61.4	61.9
82.6	81.8	79.5	80.4	81.2	80.7	82.7	82.3	80.3	81.5	80.8	81.0
0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.2	0.2
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.2	0.8	1.0	1.0	1.1	1.3	0.6	0.8	0.8	0.7	0.6	0.8
1.2	0.8	1.0	1.0	1.2	1.4	0.6	0.8	0.8	0.7	0.8	1.0
69	80	85	82	90	75	59	62	65	62	79	67
1 NS	1 DNS	1 DNS	1 DNS	1 DNS	1 DNS	1 NS	1 NS	1 NS	1 NS	1 DNS	1 NS
WHEAT NON-GRADE DATA:											
0.5	0.4	0.5	0.5	0.7	0.7	0.5	0.3	0.5	0.5	0.4	0.5
11.0	11.0	11.4	11.2	11.2	11.4	12.7	12.8	12.7	12.7	12.9	12.8
12.9/14.6	14.2/16.1	15.5/17.6	14.9/16.9	14.1/16.0	14.2/16.1	13.0/14.8	14.0/15.9	15.5/17.7	14.4/16.3	14.1/16.1	14.0/15.9
1.56/1.82	1.50/1.74	1.51/1.76	1.52/1.76	1.51/1.75	1.52/1.77	1.51/1.76	1.50/1.74	1.51/1.75	1.51/1.75	1.50/1.75	1.57/1.82
30.8	30.0	27.8	28.7	30.7	30.5	35.8	33.0	31.0	32.9	31.1	30.7
36/61/3	35/61/4	22/72/6	27/68/5	38/58/4	40/57/4	62/37/1	58/40/2	41/55/4	52/46/3	48/49/3	50/47/3
79	79	79	79	77	81	83	80	80	81	80	84
33.8	33.2	28.9	30.5	31.6	32.3	34.4	35.4	32.8	33.9	32.8	32.4
2.37	2.34	2.12	2.20	2.28	2.35	2.49	2.49	2.35	2.43	2.40	2.37
61.0	65.0	68.0	66.4	65.3	64.0	60.0	67.0	67.0	64.8	63.3	59.7
364	401	365	372	375	376	372	421	397	396	382	384
<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
FLOUR DATA:											
71.4	71.9	70.0	70.6	67.1	67.3	72.4	73.0	71.0	71.9	66.5	68.8
90.3	90.2	89.8	89.9	91.0	90.9	90.3	90.2	89.8	90.0	90.9	90.6
-1.1	-1.1	-1.0	-1.0	-1.2	-1.1	-1.0	-0.9	-0.9	-0.9	-1.1	-1.0
9.8	9.9	10.0	10.0	9.7	9.6	9.3	9.3	9.6	9.4	9.5	9.2
12.1/14.1	13.5/15.7	14.8/17.2	14.2/16.5	13.1/15.3	13.1/15.3	12.0/14.0	13.3/15.5	14.7/17.1	13.5/15.7	12.9/15.0	12.9/15.0
0.57/0.66	0.57/0.67	0.59/0.68	0.58/0.68	0.50/0.58	0.50/0.58	0.56/0.65	0.58/0.67	0.59/0.69	0.58/0.67	0.49/0.57	0.53/0.61
30.3	34.7	39.3	37.1	33.9	34.9	29.8	33.2	38.3	34.4	33.2	34.1
96	91	82	86	92	90	97	96	91	94	96	93
389	425	393	399	396	396	393	411	427	413	387	393
588	640	568	586	656	624	640	666	513	591	679	616
6.1	7.3	6.6	6.7	7.0	7.0	7.0	7.4	6.8	7.0	7.2	7.6
0.63	0.65	0.67	0.66	0.65	0.65	0.65	0.66	0.67	0.66	0.68	0.68
71/117	71/119	70/119	70/119	69/119	73/128	69/111	70/115	70/116	70/114	68/116	74/124
139/104	142/101	144/96	143/98	143/100	151/107	135/97	141/98	141/93	139/95	144/96	146/97
DOUGH PROPERTIES:											
6.8	6.2	8.3	7.7	8.0	7.4	6.5	7.5	7.8	7.3	8.2	6.7
8.5	8.0	10.3	9.6	10.3	11.0	9.9	11.5	13.8	12.0	14.2	11.2
61.5	63.3	64.2	63.6	63.4	63.3	61.1	61.9	63.5	62.4	62.4	63.2
77	76	76	76	82	92	80	79	81	80	85	90
122	153	153	149	140	119	117	145	141	135	140	112
0.63	0.49	0.50	0.51	0.58	0.78	0.69	0.54	0.57	0.60	0.61	0.80
320	348	364	355	377	363	315	377	394	366	412	344
441/679	414/724	421/806	422/771	481/1028	448/771	456/645	541/836	556/813	522/768	571/975	438/665
15.7/12.8	16.3/12.8	17.0/13.7	16.7/13.4	16.1/11.0	16.8/13.6	16.0/13.7	15.4/14.4	16.8/13.3	16.2/13.7	17.0/12.9	16.8/14.9
90/112	87/121	93/148	91/137	100/148	98/134	99/116	108/160	122/139	111/137	125/164	96/126
BAKING EVALUATION:											
65.5	67.5	68.5	67.9	70.2	67.4	63.6	65.6	68.4	66.2	68.2	65.5
8.0	8.0	8.5	8.3	8.0	7.8	8.0	8.0	8.0	8.0	7.8	8.1
915	910	1030	989	1010	981	845	950	1010	944	959	971
PRODUCTION OF 7 STATES (%):											
7	11	34	53			14	12	21	47		

*Protein Range: Low, <13.5%; Med, 13.5 to 14.5%; High, >14.5%.



Artisan Bread

HARD RED SPRING

EXPORT CARGO DATA

HARD RED SPRING

	PNW AVERAGE		GREAT LAKES AVERAGE		GULF AVERAGE	
	2016	2015	2016	2015	2016	2015
WHEAT GRADE DATA:						
Test Weight (lb/bu)	62.1	61.9	62.2	62.2	61.8	62.0
(kg/hl)	81.7	81.5	81.8	81.8	81.2	81.6
Damaged Kernels (%)	0.4	0.5	1.2	1.6	1.1	1.2
Foreign Material (%)	0.1	0.1	0.1	0.1	0.1	0.1
Shrunken & Broken (%)	1.1	1.3	0.8	0.8	0.8	0.8
Total Defects (%)	1.5	1.8	2.1	2.5	2.1	2.1
Vitreous Kernels (%)	69	71	40	41	55	53
Grade	1 NS	1 NS	1 NS	1 NS	1 NS	1 NS
WHEAT NON-GRADE DATA:						
Dockage (%)	0.3	0.3	0.5	0.5	0.7	0.6
Moisture (%)	11.3	10.4	11.5	11.2	11.8	11.2
Protein (%) 12%/0% moisture basis	14.2/16.2	14.0/15.9	14.1/16.0	13.7/15.6	13.7/15.6	13.5/15.4
Ash (%) 14%/0% moisture basis	1.56/1.82	1.60/1.87	1.55/1.80	1.57/1.83	1.56/1.81	1.57/1.83
1000 Kernel Weight (g)	30.9	31.0	31.8	32.6	32.4	33.1
Kernel Size (%) lg/md/sm	47/49/4	41/56/3	53/45/2	58/40/2	54/44/2	58/39/3
Single Kernel: Hardness	76	76	77	78	77	79
Weight (mg)	33.4	32.7	34.8	34.6	34.2	34.9
Diameter (mm)	2.67	2.65	2.76	2.78	2.72	2.78
Sedimentation (cc)						
Falling Number (sec)	407	404	405	369	423	398
DON (ppm)	0.7	0.6	1.4	1.1	1.0	1.3
FLOUR DATA:						
Lab Mill Extraction (%)	71.1	69.6	71.6	70.9	71.2	70.2
Color: L*	89.6	90.2	89.4	90.1	89.6	90.3
a*	-1.0	-1.1	-0.9	-0.9	-0.9	-0.9
b*	9.7	9.6	9.4	9.3	9.1	9.1
Protein (%) 14%/0% moisture basis	13.4/15.5	13.9/16.2	13.1/15.2	13.4/15.5	12.8/14.9	13.3/15.5
Ash (%) 14%/0% moisture basis	0.58/0.68	0.55/0.64	0.59/0.68	0.55/0.64	0.59/0.68	0.55/0.64
Wet Gluten (%)	35.3	35.0	33.7	34.1	32.5	33.0
Gluten Index	81	78	86	85	90	85
Falling Number (sec)	453	455	434	412	456	444
Amylograph Viscosity: 65g (BU)	570	578	543	476	604	548
Starch Damage (%)						
SRC: GPI						
Water / 50% Sucrose						
5% Lactic Acid / 5% Na ₂ CO ₃						
DOUGH PROPERTIES:						
Farinograph: Peak Time (min)	6.8	7.1	7.2	7.3	7.7	7.6
Stability (min)	8.5	8.6	9.9	9.4	11.3	10.5
Absorption (%)	63.4	62.7	62.4	62.4	61.7	61.3
Alveograph: P (mm)	76	79	78	76	79	78
L (mm)	138	127	135	122	129	122
P/L Ratio	0.55	0.62	0.58	0.63	0.62	0.65
W (10 ⁻⁴ J)	313	315	328	303	336	320
Extensograph: Resistance (BU)						
(45/135 min) Extensibility (cm)						
Area (cm ²)						
BAKING EVALUATION:						
Pan Bread: Bake Absorption (%)	70.3	69.9	69.8	69.0	69.3	68.2
Crumb Grain and Texture (1-10)	7.7	7.6	7.8	7.7	7.7	7.7
Loaf Volume (cc)	959	988	969	979	923	963
SAMPLE COUNT	197	154	28	44	16	51



Asian Noodles

HARD WHITE

HARVEST SURVEY: The 2017 hard white wheat (HW) crop was grown primarily in Colorado, Kansas, Idaho and Nebraska. Other states including California, Montana, North Dakota and South Dakota had limited production. U.S. Wheat Associates estimates 2017 HW production at 883,300 metric tons (MT), down slightly from 2016's 898,600 MT reported by USDA.

WHEAT AND GRADE DATA: All six composites graded U.S. No. 1 with test weight ranging from 61.4 to 65.2 lb/bu (80.7 to 85.7 kg/hl). The ranges of values found in the composites are: dockage from 0.1 to 0.7%; wheat moisture from 7.7% to 11.1%; wheat protein from 10.4% to 13.3% (12% mb); wheat ash from 1.45% to 1.57% (14% mb); kernel hardness from 59.4 to 72.3; and kernel diameters from 2.67 to 2.93 mm. The thousand kernel weights (TKW) of Pacific Northwest (PNW) low- and high-protein composites and California low- and high-protein composites are 32.9 g or higher, while the TKW of Southern Plains low- and medium-protein composites are 29.0 g and 29.7 g, respectively. Falling number values are 299 sec or higher for all composites, indicating mostly sound grain.

FLOUR, DOUGH AND BAKING DATA: Buhler laboratory mill straight-grade flour extractions range from 71.1% to 74.5%, L* values (whiteness) from 91.3 to 92.0, flour protein from 9.1% to 12.4% (14% mb), and flour ash from 0.39% to 0.46% (14% mb). These values are within the historical ranges of HW flour.

Flour wet gluten contents range from 19.0% to 31.3% depending on flour protein content. Amylograph peak viscosities are between 345 BU and 929 BU, which show good starch pasting properties for most samples that are

suitable for Asian noodle application. Starch damage values are in the range of 3.8% to 5.3%. Lactic acid SRC values are 117% to 159%, indicating medium to strong gluten strength.

Farinograph absorptions range from 56.9% to 66.0% and stability times from 7.9 min to 17.1 min, exhibiting the typically medium to strong dough characteristics of HW. HW farinograph water absorption is usually between that of HRW and HRS depending on protein content, and stability time is longer, indicating more tolerance to overmixing. The ranges of alveograph values are: P values 83 mm to 197 mm; L values 58 mm to 96 mm; and W values 212 to 439 (10⁻⁴ J). Extensograph data at 135-min resting show that maximum resistance is in the range of 646 BU to 1180 BU, extensibility from 11.8 cm to 18.6 cm and area from 108 cm² to 225 cm².

Most samples show good baking performance relative to protein content, with bake absorptions in the range of 62.0% to 71.1%, loaf volumes of 762 cc to 953 cc and crumb grain and texture scores of 5.0 points to 7.5 points.

NOODLE EVALUATION: HW flours and a control flour were evaluated for both Chinese raw noodles (white salted) and Chinese wet noodles (yellow alkaline). For Chinese raw noodles, the L* values at 0 hr of production and after 24 hr of storage at room temperature are acceptable for all samples except for the California high-protein composite, which has a L* 24 hr value of 70.5 (72 is the minimum value at 24 hr). The sensory color stability score is close to acceptable for most samples (7.0 is the control noodle). Cooked noodle texture is softer for California high-protein composite and Southern Plains low-protein composite due to low amylograph peak viscosity and low protein content, respectively.

52
SAMPLES

Collected by state and private inspection agencies; commercial wheat handlers; Plains Grains, Inc.; and state wheat commissions.

The Wheat Marketing Center (WMC) conducted the quality analyses. The Federal Grain Inspection Service (FGIS) graded the samples.

Official grade factors were determined on each sample. Non-grade factors and functionality tests were conducted on 6 composite samples categorized by growing region and protein ranges of <11.5%, 11.5% to 12.5% and >12.5%. The growing regions are highlighted on the map on page 23. The methods are described in the Analysis Methods section of this booklet.

ABOUT HW WHEAT

Medium to high protein content, hard endosperm, white bran. Used in Asian noodles, whole wheat or high extraction flour applications, pan breads and flat breads.

For Chinese wet noodles, sensory color stability scores are acceptable for PNW composites and Southern Plains composites. The cooked noodle hardness values of all Chinese wet noodles indicate acceptable texture. Overall, this year's HW samples will produce noodles with more acceptable color and texture if low ash patent flour is used.

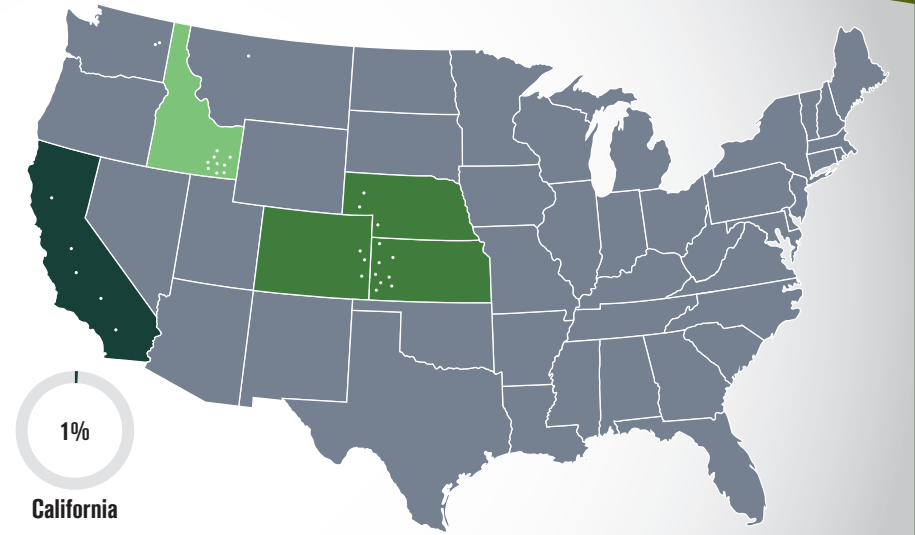
STEAMED BREAD EVALUATION: HW flours were evaluated for Asian steamed breads in comparison with a control flour. Results show most samples are acceptable for

steamed breads except for the Southern Plains low- and medium-protein composites, which indicate slightly low total product scores. The specific volumes are similar for all samples except for the California high-protein composite because its dough was a slightly strong for steamed bread expansion. Blending 10% to 25% of SW flour with high protein HW flour would improve overall steamed bread quality.

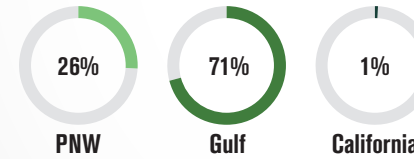
SUMMARY: This year's samples show good quality performance in milling, dough rheological properties and end products,

including pan breads, Asian noodles and steamed breads. PNW low- and high-protein composites and California high-protein composite have very good bread baking potential. For Asian noodle applications, most samples have good noodle color and color stability in both raw noodle and wet noodle and produce noodles of acceptable texture. For steamed breads, it is recommended that high protein HW flour be blended with a small portion of SW flour to improve product quality by avoiding steamed bread shrinkage.

5 STATES SURVEYED
98%
OF TOTAL HW PRODUCTION REPRESENTED



Percentage of total U.S. HW production by region.

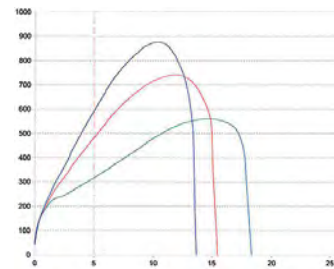
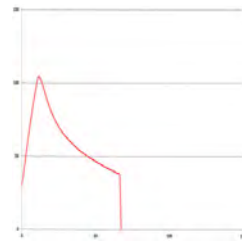
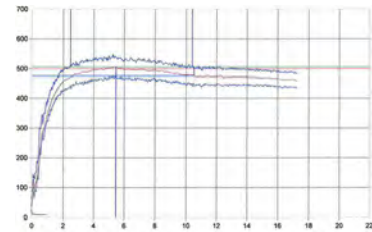


FARINOGRAMS

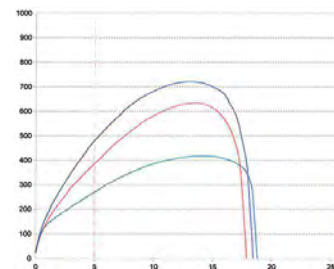
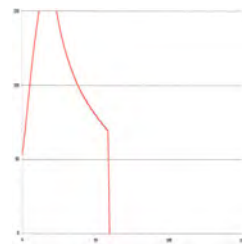
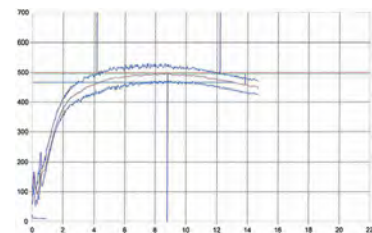
ALVEOGRAMS

EXTENSOGRAMS

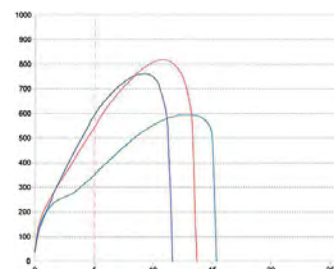
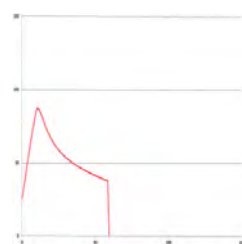
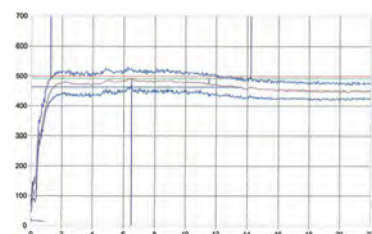
CALIFORNIA LOW



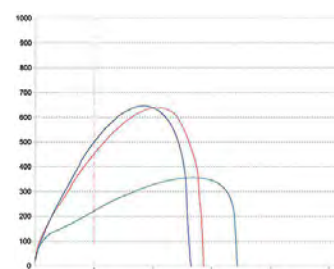
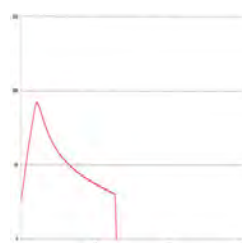
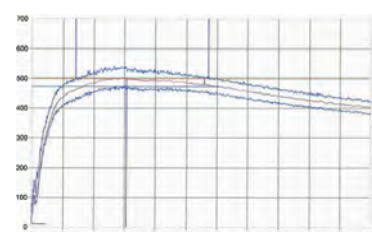
CALIFORNIA HIGH



SOUTHERN PLAINS LOW



SOUTHERN PLAINS MEDIUM



HARD WHITE PRODUCTION

for the major producing states (million metric tons)

	2017	2016	2015	2014	2013
California	0.01	0.02	0.02	0.03	0.06
Colorado	0.26	0.20	0.12	0.12	0.06
Idaho	0.23	0.20	0.14	0.21	0.21
Kansas	0.27	0.38	0.26	0.13	0.17
Nebraska	0.09	0.08	0.04	0.02	0.00
Five-State Total	0.87	0.88	0.58	0.51	0.50
Total HW Production	0.88	0.90	0.59	0.56	0.61

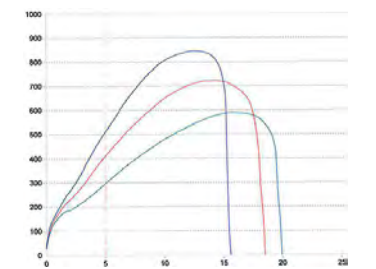
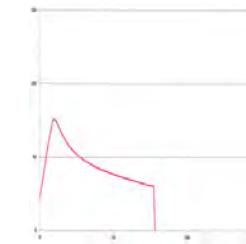
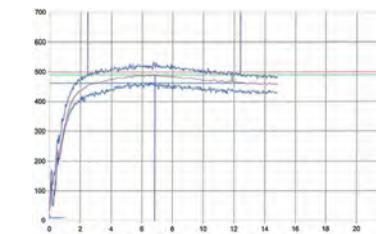
Based on USDA crop estimates as of September 29, 2017.

FARINOGRAMS

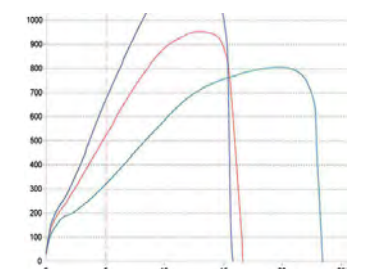
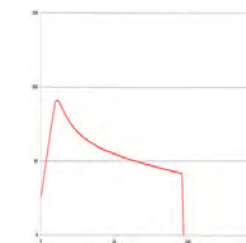
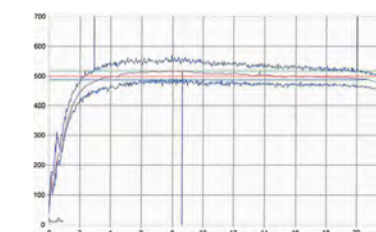
ALVEOGRAMS

EXTENSOGRAMS

PNW LOW



PNW HIGH



HARD WHITE

HARVEST DATA

HARD WHITE	PACIFIC NORTHWEST 2017 BY PROTEIN*		CALIFORNIA 2017 BY PROTEIN*		SOUTHERN PLAINS 2017 BY PROTEIN*	
	Low	High	Low	High	Low	Med
	WHEAT GRADE DATA:					
Test Weight (lb/bu)	64.3	63.5	63.1	65.2	61.9	61.4
(kg/hl)	84.5	83.5	82.9	85.7	81.4	80.7
Damaged Kernels (%)	0.0	0.0	0.0	0.0	0.0	0.0
Foreign Material (%)	0.0	0.0	0.1	0.0	0.0	0.1
Shrunken & Broken (%)	0.4	0.8	0.6	0.2	0.7	0.7
Total Defects (%)	0.4	0.8	0.7	0.2	0.7	0.8
Grade	1 HW	1 HW	1 HW	1 HW	1 HW	1 HW
WHEAT NON-GRADE DATA:						
Dockage (%)	0.4	0.7	0.1	0.2	0.4	0.4
Moisture (%)	8.9	9.6	7.7	10.0	10.0	11.1
Protein (%) 12%/0% moisture basis	11.4/13.0	13.3/15.1	11.3/12.8	13.2/15.0	10.4/11.2	12.2/13.7
Ash (%) 14%/0% moisture basis	1.55/1.80	1.57/1.77	1.45/1.68	1.45/1.68	1.56/1.81	1.53/1.78
1000 Kernel Weight (g)	35.9	35.8	32.9	38.9	29.0	29.7
Kernel Size (%) lg/md/sm	93/7/0	91/9/0	87/13/0	95/5/0	77/22/1	76/23/1
Single Kernel: Hardness	59.4	63.3	72.3	64.8	67.3	62.3
Weight (mg)	44.0	42.2	37.1	42.1	32.1	36.5
Diameter (mm)	2.93	2.91	2.81	2.91	2.67	2.71
Sedimentation (cc)	31.0	42.0	26.8	43.3	28.8	30.3
Falling Number (sec)	401	367	485	299	432	418
FLOUR DATA:						
Lab Mill Extraction (%)	74.5	72.2	71.3	71.1	71.8	72.1
Color: L*	92.0	91.7	91.3	91.9	91.8	91.3
a*	-1.7	-1.7	-1.7	-1.1	-2.2	-2.0
b*	7.8	8.1	7.8	5.9	9.0	9.3
Protein (%) 14%/0% moisture basis	10.5/12.2	12.0/14.0	10.4/12.1	12.4/14.4	9.1/10.6	10.8/12.6
Ash (%) 14%/0% moisture basis	0.46/0.53	0.46/0.53	0.46/0.53	0.39/0.45	0.41/0.48	0.45/0.52
Wet Gluten (%)	25.5	28.7	25.1	31.3	19.0	32.7
Gluten Index	97	98	96	86	99	76
Falling Number (sec)	360	390	438	337	433	421
Amylograph Viscosity 65 g (BU)	929	804	629	345	885	787
Starch Damage (%)	4.3	3.8	4.9	5.3	4.8	4.6
SRC: GPI	0.71	0.80	0.59	0.67	0.69	0.63
Water / 50% Sucrose	65/106	65/113	65/107	74/114	65/101	66/107
5% Lactic Acid / 5% Na ₂ CO ₃	137/87	159/86	117/92	142/98	131/90	121/85
DOUGH PROPERTIES:						
Farinograph: Peak Time (min)	6.9	8.7	5.5	8.8	6.5	6.2
Stability (min)	9.9	17.1	7.9	8.0	13.0	8.6
Absorption (%)	58.3	59.6	61.2	66.0	56.9	60.8
Alveograph: P (mm)	83	100	114	197	96	101
L (mm)	77	96	66	58	58	63
P/L Ratio	1.08	1.04	1.73	3.40	1.66	1.60
W (10 ⁻⁴ J)	231	365	269	439	212	222
Extensograph: Resistance (BU)	589/844	805/1180	580/875	417/720	595/761	357/646
(45/135 min) Extensibility (cm)	20.1/15.6	23.6/15.8	18.5/13.7	19.0/18.6	15.5/11.8	17.2/13.3
Area (cm ²)	147/164	232/225	131/149	107/176	116/112	80/108
BAKING EVALUATION:						
Pan Bread: Bake Absorption (%)	63.3	64.6	66.4	71.1	62.0	65.6
Crumb Grain and Texture (1-10)	7.0	7.0	6.0	6.5	5.0	7.5
Loaf Volume (cc)	901	953	759	903	762	843

*Protein Range: Low, <11.5%; Med, 11.5 to 12.5%; High, 12.6 to 13.5%.

HARD WHITE

HARVEST DATA

HARD WHITE	PACIFIC NORTHWEST 2017 BY PROTEIN*		CALIFORNIA 2017 BY PROTEIN*		SOUTHERN PLAINS 2017 BY PROTEIN*	
	Low	High	Low	High	Low	Med
	CHINESE RAW NOODLE-MAKING QUALITY:					
Color at 0/24 hour: L*	84.9/72.5	84.0/72.1	83.9/71.8	83.7/70.5	86.7/77.3	84.3/72.3
a*	0.1/0.8	0.3/1.4	0.1/0.5	0.9/1.4	-0.4/-0.3	0.0/0.7
b*	17.4/21.2	17.8/23.6	17.2/20.5	15.5/18.4	17.1/22.1	19.0/25.1
Change in L* (0-24 hr)	12.4	11.9	12.1	13.2	9.4	12.0
Cooking Yield (5 min, %)	113	111	115	110	119	111
Sensory Color Stability Score	6.3	6.7	6.8	6.2	7.5	6.8
Instrumental Texture:						
Firmness (g)	1104	1154	1141	1061	1006	1153
Springiness (%)	96.6	94.6	95.2	94.7	91.7	93.9
Cohesiveness	0.65	0.66	0.71	0.69	0.66	0.66
Chewiness (g)	722	765	805	727	659	755
CHINESE WET NOODLE-MAKING QUALITY:						
Uncooked Color at 0/24 hour: L*	79.9/67.2	79.2/67.7	80.0/67.9	79.5/64.4	83.0/72.3	80.2/62.3
a*	-1.8/-0.4	-1.5/-0.5	-1.6/-0.4	-1.3/-0.5	-1.7/-0.7	-1.6/-0.4
b*	21.4/21.6	22.7/23.3	20.0/21.9	18.4/18.6	21.0/24.0	22.3/23.6
Change in L* (0-24 hr)	12.7	11.6	12.1	15.1	10.8	17.9
Parboiled Color at 0/24 hour: L*	76.8/77.2	77.2/77.5	77.0/77.1	77.0/77.3	78.8/79.8	77.2/77.9
a*	-1.8/-2.7	-1.9/-2.7	-2.2/-2.5	-1.6/-2.5	-2.8/-3.5	-1.9/3.0
b*	28.4/26.5	29.3/27.8	28.1/26.4	25.3/23.8	32.5/30.7	31.1/29.4
Cooking Yield (1.5 min, %)	49	49	46	49	45	46
Uncooked Color Stability Score	6.2	7.0	6.5	5.7	7.2	6.7
Parboiled Color Stability Score	6.5	6.8	5.8	6.0	7.8	6.8
Instrumental Texture:						
Firmness (g)	775	765	742	684	745	755
Springiness (%)	93.7	90.4	94.5	94.1	93.7	89.6
Cohesiveness	0.65	0.64	0.68	0.68	0.63	0.63
Chewiness (g)	504	493	503	465	469	477
ASIAN-TYPE STEAMED BREAD EVALUATION:						
Specific Volume (ml/g)	2.8	2.7	2.7	2.3	2.5	2.6
Total Score	71.3	70.0	71.3	68.3	67.5	67.3

*Protein Range: Low, <11.5%; Med, 11.5 to 12.5%; High, 12.6 to 13.5%.



Flat Bread



Couscous

DURUM

NORTHERN GREAT PLAINS

WEATHER AND HARVEST: Durum production in the U.S. Northern Plains is down by more than 50% from 2016 due to a small decline in acreage and sharply lower yields caused by severe drought. Planting began in the third week of April, progressed rapidly due to warm conditions and few rain delays, and was finished by the end of May.

Overly dry soil conditions were an increasing concern throughout the growing season. Emergence was slow in areas due to lack of moisture, and yield potential across the region was quite low with some acres abandoned. The dry conditions pushed crop development ahead of normal, but kept disease pressures minimal.

Harvest began in early August, moved quickly due to dry conditions and lower yields, and finished by late September. Scattered rain delays toward the end of harvest affected the color of a portion of the crop.

WHEAT AND GRADE DATA: The 2017 Northern durum crop average grade is U.S. No. 1 Hard Amber Durum (HAD). However, a larger portion of the samples than in 2016 graded U.S. No. 1 or 2 Amber Durum due to color loss in some areas. Average test weight of 60.9 lb/bu (79.4 kg/hl) is slightly below last year. Dry conditions allowed very little disease pressure and kept kernel damage below previous years at only 0.1%. The average total defects of 1.2% is slightly higher due to higher shrunken and broken kernel values. Average vitreous kernel content (HVAC) is 88%, with 45% of samples having levels of 90% or higher. A larger portion of the samples (25% versus 11% last year) fall into the 60% to 74% HVAC range, reflecting the impact of rain on some of the crop.

Hot, dry conditions pushed protein levels higher, with the 2017 regional average at 14.5% (12% moisture basis). Average thousand kernel weight is 38.4 g, compared to 40 g in 2016; the largest declines were in extremely dry areas of Montana and southwest North Dakota. Higher-than-average dockage of 1.1% resulted from challenging threshing conditions with heavier-than-normal weed growth in thin crops. Due to limited disease pressure, DON is barely detectable in this year's crop. Moisture of 11.3% reflects mostly dry harvest conditions, and average falling number of 380 sec represents a mostly sound crop.

SEMOLINA AND PROCESSING DATA: The Buhler laboratory mill average total extraction is 72.2%, slightly lower than last year, but above the 5-year average. Semolina extraction of 68.5%, however, is higher than last year and the 5-year average. The decline in total extraction is related to overall smaller kernel size, while the dry harvest conditions promoted kernel hardness and high HVAC, for improved semolina extraction. The milled product ash is 0.69%, compared to 0.71% in 2016, and the speck count is lower. Wet gluten of 34.5% is higher than last year and similar to the 5-year average. The average gluten index of 86.3% is notably higher than last year's 60.8%. This reflects a combination of varietal changes and conducive growing conditions.

Semolina properties are quite similar to last year. The b* (yellow) color score of 29.4 is slightly lower than 2016 and similar to the 5-year average. Mixing properties are stronger than last year and the 5-year average. Evaluation of the cooked spaghetti shows lower cooking loss than last year and higher cooked firmness. Pasta color scores are also

210
SAMPLES

Collected from fields, farm bins and local elevators by the National Agricultural Statistics Service.

The Durum Quality Lab, North Dakota State University, Fargo, ND, conducted the quality analyses.

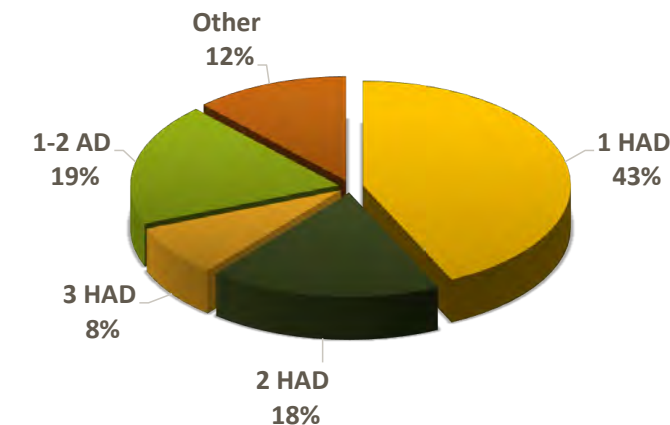
Official grade, test weight, vitreous kernel, thousand kernel weight, protein and falling number were determined on each sample. The remaining tests were conducted on 6 composite samples categorized by growing region for Northern Durum. Northern Durum production area is highlighted on the map on page 28. The methods are described in the Analysis Methods section of this booklet.

ABOUT DURUM WHEAT
Durum is the hardest of all wheats with high protein content, yellow endosperm, white bran. Used to make pasta, couscous and some Mediterranean breads.

improved this year, with an average color score for the region of 9.

SUMMARY: Buyers will be pleased with this year's excellent grading crop boasting strong protein levels, overall high vitreous kernel levels, higher semolina extraction and improved mixing and pasta quality characteristics. With reduced supply and isolated areas with lower vitreous kernel levels, lighter thousand kernel weights and some DON detections, buyers should always remain diligent in their contract specifications.

NORTHERN DURUM GRADE DISTRIBUTION



DURUM PRODUCTION

for the major producing states (million metric tons)

	2017	2016	2015	2014	2013
Arizona	0.2	0.3	0.4	0.2	0.2
California	0.1	0.1	0.2	0.1	0.2
Montana	0.3	0.9	0.5	0.4	0.5
North Dakota	0.8	1.6	1.2	0.8	0.8
Total Durum Production	1.5	2.8	2.3	1.5	1.7

Based on USDA crop estimates as of September 29, 2017.

DESERT DURUM®

Desert Durum® is a registered certification mark of the Arizona Grain Research and Promotion Council and the California Wheat Commission, which authorize its use only to designate durum grown under irrigation in the desert valleys and lowlands of Arizona and California.

Desert Durum® can be produced and delivered "identity preserved" to domestic and export markets, which allows customers to purchase grain with quality traits specific to their processing needs. Annual requirements can be pre-contracted with grain merchandisers ahead of the fall-winter planting season for harvest in late May through early July. Varietal identity is maintained by experienced growers planting certified seed and merchandisers who store and ship according to customers' preferred delivery schedules.

2017 Desert Durum® production acreage was less than in 2016, largely due to lower prices available at planting time. Yields were average, and quality was uniformly good.

WHEAT AND GRADE DATA: In 2017, the average grade is U.S. No. 1 Hard Amber

Durum (HAD). Test weight averages 62.2 lb/bu (81.0 kg/hl). The average vitreous kernel content (HVAC) is 97.6%, a high average typical of Desert Durum®. Average damaged kernels are 0.2% and total defects are 1%. Low moisture content is characteristic of Desert Durum®; this year's average is 6.6%. Protein content averages 13.5% (12% mb).

SEMOLINA AND PROCESSING DATA: Semolina color improved in 2017. The semolina b* value is 30.9, higher than both 2016 and the 5-year average. Wet gluten of 33% and gluten index of 76% are similar to the 5-year averages. Semolina mixograph score is 7 and alveograph W value is 266 (10⁻⁴ J), both of which indicate high strength. Pasta color b* value is 44 and score is 10, significantly higher than the 5-year average. Pasta cooked firmness is 5.5.

SUMMARY: Desert Durum® exhibits consistently large kernels and low moisture, traits that contribute to efficient transportation costs and high extraction rates. The 2017 crop will deliver the valuable milling, semolina and pasta quality traits that customers have learned to expect and appreciate.

17
SAMPLES

Collected by a Federal Grain Inspection Service (FGIS) licensed inspection agency or submitted by handlers to a licensed agency.

California Wheat Commission Laboratory conducted the quality analyses. Milling of Desert Durum® samples is done by the Durum Quality Lab, North Dakota State University, Fargo, ND.

All tests were conducted on each sample. Production-weighted results are reported. The Desert Durum® production area is highlighted on the map on page 28. The methods are described in the Analysis Methods section of this booklet.

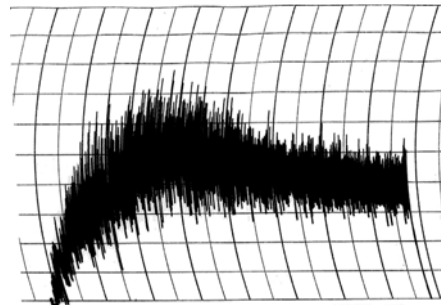
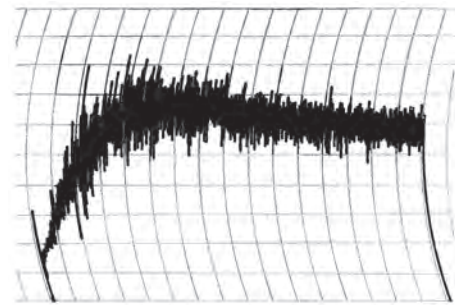
EXPORT CARGO SURVEY

The export cargo data represent 24 individual subplot samples provided by USDA's Federal Grain Inspection Service for crop year 2016 (collected from October 2016 through June 2017) and 22 samples for 2015. Grade data are the official grades on the individual subplots. North Dakota State University conducted the milling and processing analyses.

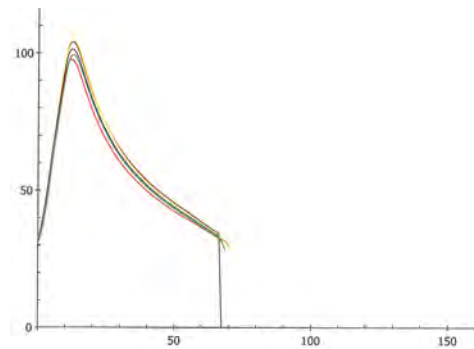
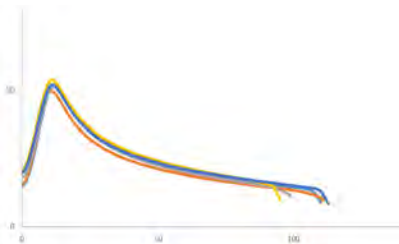
NORTHERN DURUM REGIONAL AVERAGE

DESERT DURUM® REGIONAL AVERAGE

MIXOGRAMS

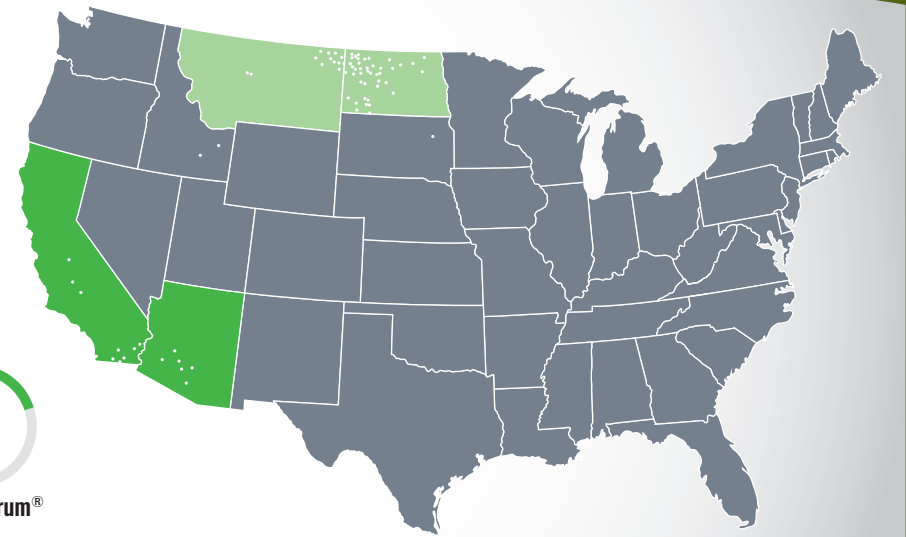


ALVEOGRAMS

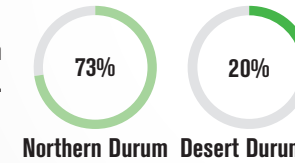


4 STATES SURVEYED

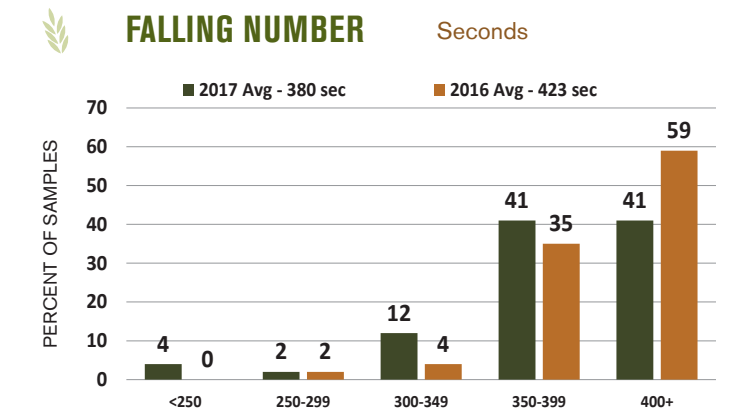
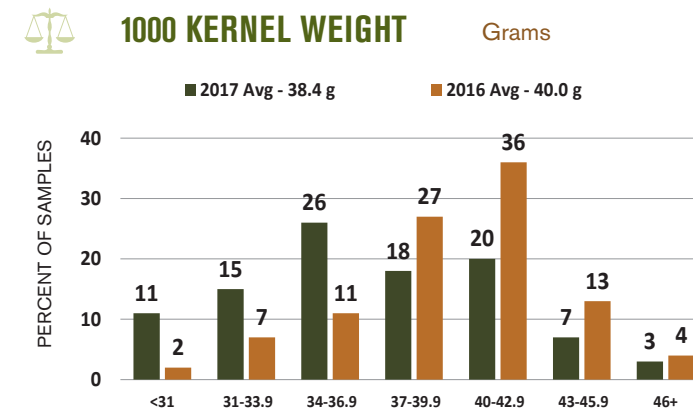
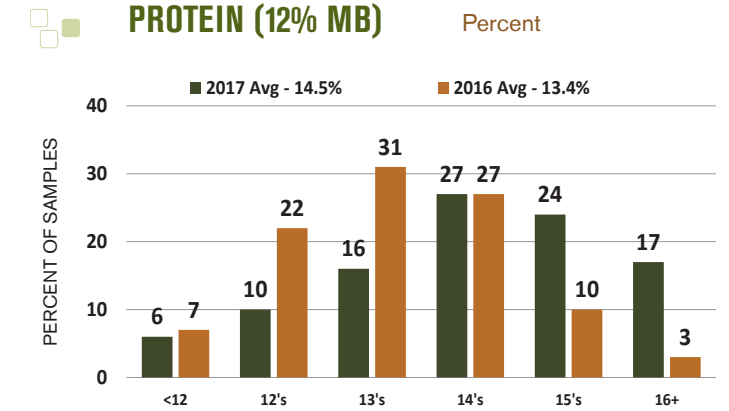
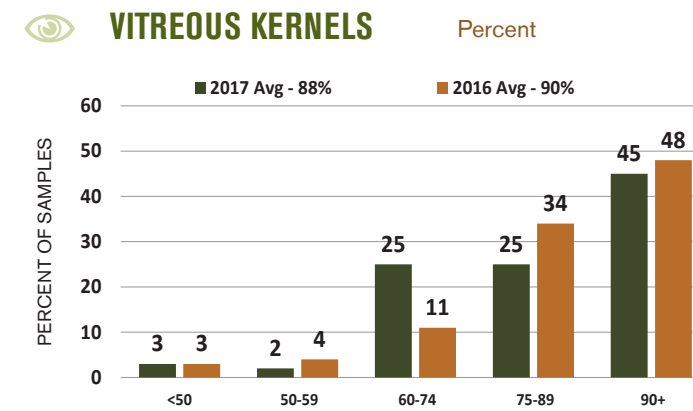
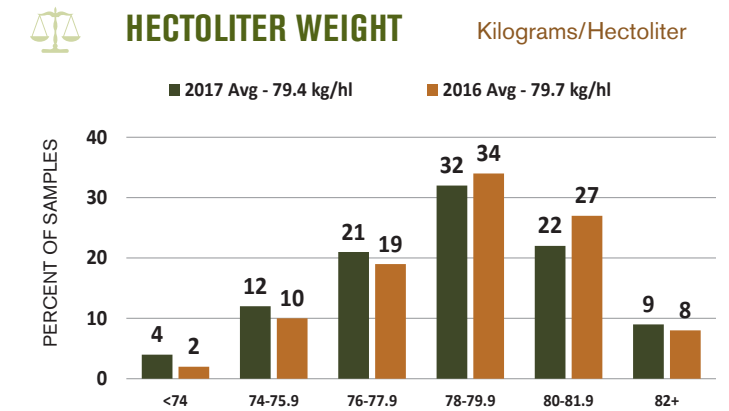
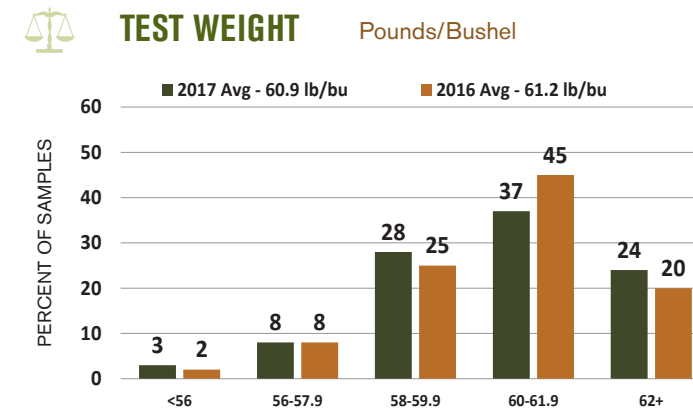
93% OF TOTAL DURUM PRODUCTION REPRESENTED



Percentage of total U.S. durum production by region.



NORTHERN DURUM DISTRIBUTIONS



DURUM

HARVEST AND EXPORT DATA

DURUM	HARVEST DATA						EXPORT CARGO DATA			
	NORTHERN DURUM			DESERT DURUM®			NORTHERN DURUM		DESERT DURUM®	
	2017	2016	5-Year Avg	2017	2016	5-Year Avg	2016	2015	2016	2015
WHEAT GRADE DATA:										
Test Weight (lb/bu)	60.9	61.2	60.4	62.2	62.9	62.7	61.1	60.6	62.9	61.5
(kg/hl)	79.4	79.7	78.7	81.0	81.9	81.7	79.6	78.9	81.9	80.1
Damaged Kernels (%)	0.1	0.4	0.4	0.2	0.2	0.2	2.3	3.2	0.4	0.8
Foreign Material (%)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.1
Shrunken and Broken (%)	1.1	0.8	1.0	0.7	0.4	0.5	1.1	1.4	1.0	0.7
Total Defects (%)	1.2	1.2	1.4	1.0	0.8	0.8	3.6	4.7	1.6	1.6
Contrasting Classes (%)	0.0	0.9	0.2	0.0	0.0	0.0	1.1	1.4	0.4	0.1
Vitreous Kernels (%)	88	90	86	98	97	96	69	69	89	92
Grade	1 HAD	1 HAD	1 HAD	1 HAD	1 HAD	1 HAD	2 AD	2 AD	1 HAD	1 HAD
WHEAT NON-GRADE DATA:										
Dockage (%)	1.1	0.2	0.7	0.5	0.5	0.4	0.4	0.6	0.7	0.4
Moisture (%)	11.3	11.4	11.5	6.6	6.8	6.7	11.8	11.8	6.6	7.5
Protein (%) 12%/0% moisture basis	14.5/16.5	13.4/15.2	13.6/15.4	13.5/15.3	13.9/15.8	13.6/15.5	13.1/14.8	13.5/15.3	13.0/14.7	13.7/15.5
Ash (%) 14%/0% moisture basis	1.46/1.70	1.61/1.87	1.59/1.85	1.66/1.93	1.76/2.04	1.73/1.97	1.59/1.85	1.64/1.90	1.55/1.80	1.64/1.91
1000 Kernel Weight (g)	38.4	40.0	39.6	49.0	49.6	48.4	40.2	39.1	44.7	46.9
Kernel Size (%) lg/md/sm	40/55/5	52/44/4	55/41/4	91/9/0	91/9/0	90/10/0	58/39/3	51/45/4	69/28/3	74/23/2
Falling Number (sec)	380	423	380	717	612	517	404	377	1585	1414
Sedimentation (cc)	87	54	54	61	65	64				
DON (ppm)	<0.5	0.7	1.2				1.8	2.3	<0.5	<0.5
SEMOLINA DATA:										
Lab Mill Extraction (%)	72.2	73.6	70.7	75.0	76.0	75.2	72.3	72.2	71.8	72.1
Semolina Extraction (%) ¹	68.5	67.9	65.2	70.0	61.9	62.1	66.5	65.9	66.2	66.9
Color: L*	83.3	84.3	84.6	86.9	85.3	87.2	83.9	84.3	84.2	84.2
a*	-2.3	-2.8	-3.2	-2.8	-3.2	-2.1	-2.6	-2.7	-2.2	-2.3
b*	29.4	30.3	29.2	30.9	28.6	26.3	28.3	27.8	25.9	24.9
Protein (%) 14%/0% moisture basis	13.8/16.0	12.6/14.7	12.6/14.7	12.4/14.4	12.9/15.0	12.6/14.7	11.9/13.8	12.3/14.3	12.0/14.0	12.2/14.1
Ash (%) 14%/0% moisture basis	0.69/0.80	0.71/0.83	0.68/0.79	0.80/0.93	0.87/1.02	0.86/1.01	0.70/0.81	0.74/0.86	0.71/0.82	0.72/0.84
Specks (no/10 sq in)	26	30	26	27	25	19	29	29	28	26
Wet Gluten (%)	34.5	32.4	34.8	33.0	33.2	33.6				
Gluten Index	86	61	54	76	76	79	50	56	76	81
Mixograph: Classification	5.7	5.1	5.4	7.0	8.0		5.5	5.6	7.0	8.0
Peak Time (min)	2.6	2.8		3.2	4.5		3.2	2.9	3.0	3.4
Peak Height (MU)	6.2	6.2		5.1	6.5		5.2	5.8	5.4	6.0
Alveograph: P (mm)	60	45	47	101	107	108				
L (mm)	99	121	113	76	65	60				
P/L Ratio	0.6	0.4	0.4	1.3	1.7	1.8				
W (10 ⁻⁴ J)	180	136	135	266	230	228				
SPAGHETTI PROCESSING DATA:										
Color Score	9.0	8.5	8.9	9.8	8.3	8.3	8.5	8.4	8.5	8.4
Cooked Weight (g)	31.0	31.0	31.3	29.1	29.3	29.4	30.8	31.0	30.7	30.4
Cooking Loss (%)	5.9	6.3	6.2	5.0	5.6	6.3	6.1	6.4	6.1	6.3
Cooked Firmness (g cm)	4.9	4.2	4.4	5.5*	6.4	7.0	4.3	3.9	4.6	4.3
SAMPLE COUNT:							21	14	3	8

*Analyzer blades have been changed, and the 2017 firmness value is not comparable with previous years.



Sponge Cake

SOFT WHITE

WEATHER AND HARVEST: The Pacific Northwest had nearly ideal growing conditions for the 2017 soft white wheat (SW) crop. There was limited to adequate soil moisture at planting, and most of the area received adequate rainfall during winter and spring. Late spring was generally warm and dry, while wheat harvest was mostly hot and dry. USDA estimates total 2017 SW production at 6.14 million metric tons (MMT), down slightly from 2016. Of that, the Washington Grain Commission estimates white club (WC) accounts for 359,000 metric tons (MT).

WHEAT AND GRADE DATA: The Overall average grade of the 2017 SW and WC crops is U.S. No. 1. The average SW test weight of 60.9 lb/bu (80.1 kg/hl) is close to last year's 60.8 lb/bu (80.0 kg/hl); WC test weight of 60.2 lb/bu (79.2 kg/hl) is slightly less than 2016's 60.8 lb/bu (80.0 kg/hl). All other SW grade factors and dockage are similar to last year and the 5-year averages. WC shrunken and broken kernel percentages are slightly higher than last year, but below the 5-year average. WC dockage is lower than last year and the 5-year average. Other WC grade factors are similar to past averages. Wheat moisture for both SW and WC is below last year and the 5-year averages, which reflects the dry harvest conditions.

The Overall SW and WC wheat protein contents (12% mb) of 9.6% and 9.4%, respectively, are each 0.5 percentage points below the respective 2016 values and well below the wheat protein 5-year averages. SW wheat ash content (14% mb) is lower than last year and the 5-year average; WC wheat ash is higher than last year, but lower than the 5-year average. Thousand kernel weights for SW and WC are below 2016 levels, but above the respective 5-year averages. Both SW

and WC kernel diameters are similar to last year and the 5-year averages. Falling number values are 337 sec for SW and 348 sec for WC, indicating sound wheat.

FLOUR, DOUGH, AND BAKE DATA: The 2017 crop Buhler laboratory mill flour extractions for SW of 73.5% and WC of 74.0% are both lower than last year and the 5-year averages. Flour protein content (14% mb) is 8.4% and 8.0% for SW and WC, respectively. Flour ash content (14% mb) for both SW and WC is slightly higher than last year, but lower than 5-year averages. Amylograph peak viscosity values are 487 BU for SW and 546 BU for WC, higher than last year. Starch damage values are lower for SW and WC than last year and 5-year averages. SW and WC solvent retention capacity (SRC) water values are similar to last year and 5-year averages; sucrose, lactic acid, and sodium carbonate values are lower than last year and the 5-year averages; and gluten performance index (GPI) is similar to last year and 5-year averages. SW and WC farinograph peak and stability times are similar to last year and the 5-year average, while water absorption is lower. The SW and WC alveograph L values are lower than last year and 5-year averages. SW and WC extensograph resistance is higher than last year and 5-year averages, but extensibility values are shorter than last year and 5-year averages. Sponge cake volume for SW at 1114 cc is smaller than last year and 5-year averages, and the total score is slightly less than last year and 5-year averages. The sponge cake volume for WC at 1176 cc is smaller than last year and 5-year averages, and total score is slightly higher than last year and 5-year averages. SW and WC cookie diameter values are larger than last year and 5-year averages. SW and WC cookie spread factors are more than last year and 5-year averages.

512
SOFT WHITE AND
96
CLUB SAMPLES

Collected from state, private grain inspection agencies and commercial wheat handling operations.

Wheat Marketing Center (WMC) conducted wheat and flour quality testing and analyses.

Federal Grain Inspection Service (FGIS) graded and tested wheat protein content.

Official grade, protein, moisture, thousand kernel weight and falling number tests were determined on each sample. The remaining tests were conducted on 3 composite samples categorized by protein ranges of <9.0%, 9.0% to 10.5%, >10.5% and one composite of all WC samples. The methods are described in the Analysis Methods section of this booklet.

ABOUT SW WHEAT

Low protein, low moisture wheat. Soft endosperm, white bran, weak gluten. Used in pastries, cakes, biscuits, crackers, flat breads, Asian-style noodles and snack foods. Can also be used for blanding.

CHINESE SOUTHERN-TYPE STEAMED BREAD:

Each flour was made into southern-type steamed bread and compared to a control flour. SW specific volume is higher than last year, but the same as the 5-year average. WC specific volume is the same as last year, but less

than the 5-year average. The SW total score is slightly lower than last year, while WC's is higher than last year.

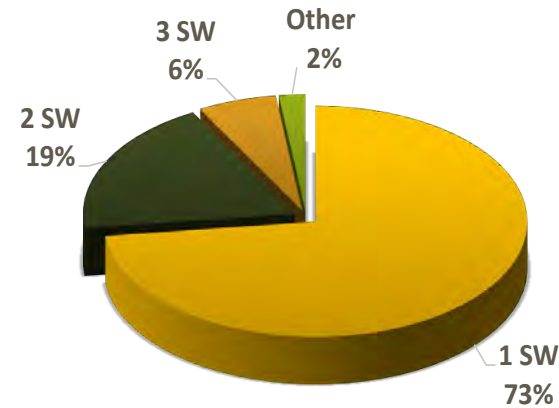
SUMMARY: The 2017 PNW soft white wheat crop is generally characterized by having similar kernel characteristics to last year with good test weight, lower moisture

content, lower protein content, higher falling number values and acceptable finished product characteristics. This year's WC quality characteristics follow the same trend as SW. The high protein segment of the SW crop provides opportunities in blends for Asian noodles, steamed breads, flat breads and pan breads.

EXPORT CARGO SURVEY

The export cargo data represent 60 individual subplot samples provided by USDA's Federal Grain Inspection Service for crop year 2016 (August 2016 through May 2017) and 90 samples for 2015 all from PNW ports. Grade data are the official grades on the individual subplots. Wheat Marketing Center conducted the milling and processing analyses.

SW GRADE DISTRIBUTION



PACIFIC NORTHWEST SOFT WHITE WHEAT PRODUCTION

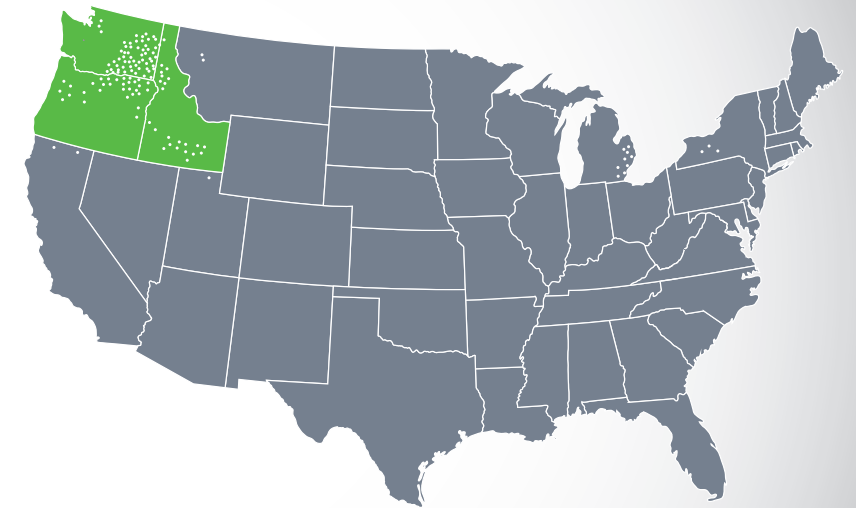
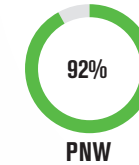
for the major producing states (million metric tons)

	2017		2016		2015		2014		2013	
	SW	CLUB	SW	CLUB	SW	CLUB	SW	CLUB	SW	CLUB
Washington	2.8	0.3	3.1	0.4	2.3	0.2	2.2	0.2	2.9	0.3
Oregon	1.1	0.0	1.0	0.0	1.0	0.0	1.1	0.0	1.3	0.0
Idaho	1.4	0.0	1.7	0.0	1.5	0.0	1.6	0.0	1.7	0.0
Three-State Total	5.3	0.4	5.8	0.5	4.7	0.2	4.9	0.2	5.9	0.3
Three-State Total Soft White Wheat	5.6		6.2		4.9		5.1		6.2	
Total US Soft White Wheat	6.1		6.9		5.4		5.5		6.7	

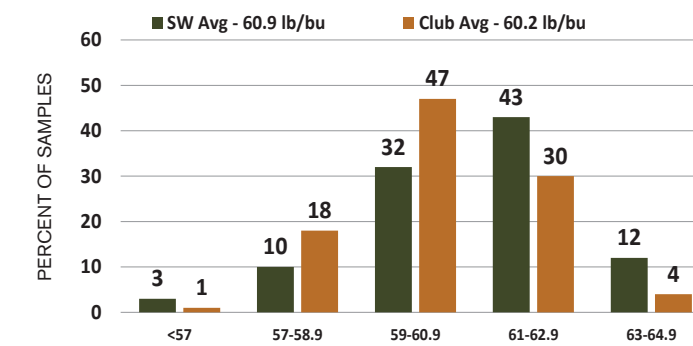
Based on USDA crop estimates as of September 29, 2017.

3 STATES SURVEYED
92%
OF TOTAL SW PRODUCTION REPRESENTED

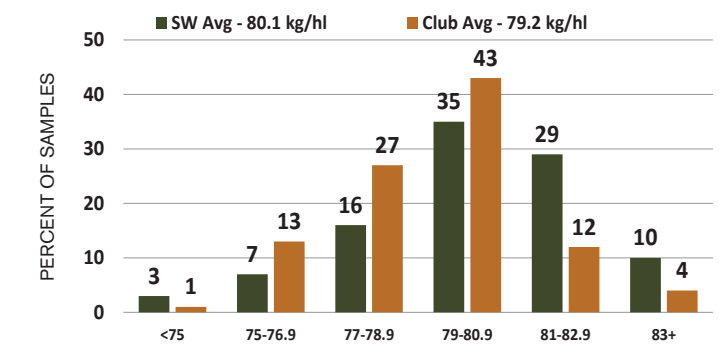
Percentage of total U.S. SW production by export tributary region.



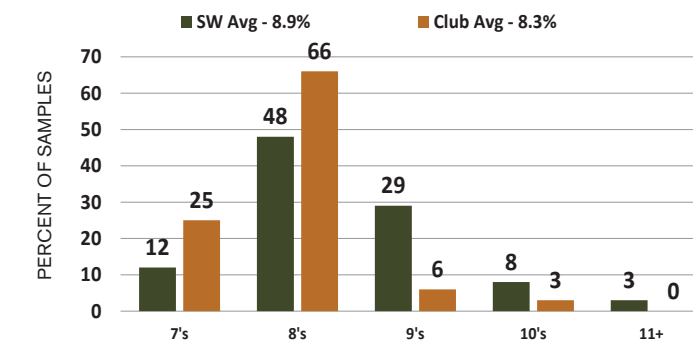
TEST WEIGHT Pounds/Bushel



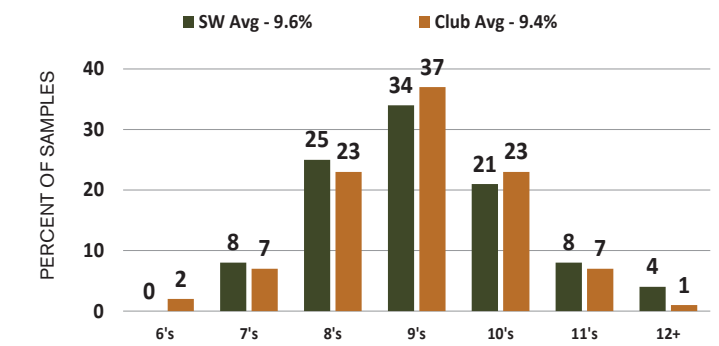
HECTOLITER WEIGHT Kilograms/Hectoliter



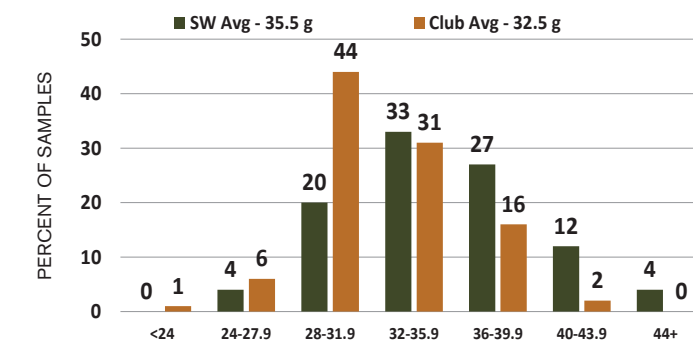
WHEAT MOISTURE Percent



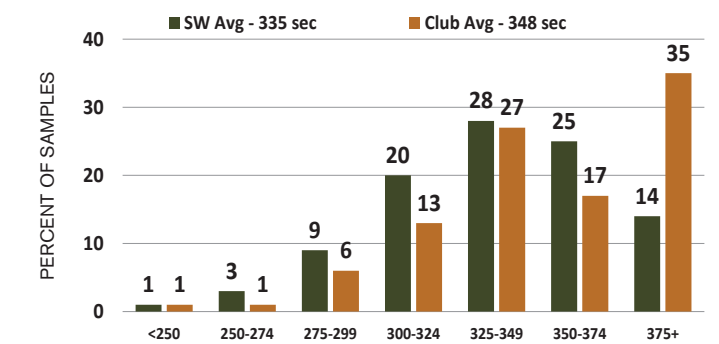
PROTEIN (12% MB) Percent



1000 KERNEL WEIGHT Grams



FALLING NUMBER Seconds



Crackers

SOFT WHITE

HARVEST DATA

SOFT WHITE	2017					2016		5-YEAR AVERAGE	
	SOFT WHITE BY PROTEIN*					CLUB		5-YEAR AVERAGE	
	Low	Med	High	Overall	AVERAGE	SW	Club	SW	Club
WHEAT GRADE DATA:									
Test Weight (lb/bu)	60.6	61.4	60.2	60.9	60.2	60.8	60.8	60.6	60.3
(kg/hl)	79.7	80.7	79.2	80.1	79.2	80.0	80.0	79.7	79.3
Damaged Kernels (%)	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Foreign Material (%)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
Shrunken & Broken (%)	0.5	0.5	0.7	0.5	1.0	0.6	0.8	0.7	1.2
Total Defects (%)	0.5	0.5	0.8	0.6	1.1	0.6	0.9	0.8	1.3
Grade	1 SW	1 SW	1 SW	1 SW	1 WC	1 SW	1 WC	1 SW	1 WC
WHEAT NON-GRADE DATA:									
Dockage (%)	0.5	0.5	0.6	0.5	0.5	0.6	0.8	0.5	0.7
Moisture (%)	9.0	8.8	8.8	8.9	8.3	9.8	9.6	9.3	8.8
Protein (%) 12%/0% moisture basis	8.3/9.4	9.7/11.0	11.5/13.1	9.6/10.9	9.4/10.7	10.1/11.4	9.9/11.3	10.2/11.6	10.4/11.9
Ash (%) 14%/0% moisture basis	1.30/1.51	1.32/1.54	1.36/1.58	1.32/1.54	1.27/1.48	1.34/1.56	1.18/1.37	1.36/1.58	1.29/1.49
1000 Kernel Weight (g)	36.2	35.9	33.1	35.5	32.5	36.3	33.7	34.6	31.6
Kernel Size (%) Ig/md/sm	91/9/0	88/12/0	79/20/1	87/12/1	79/21/0	88/11/1	77/22/1	83/16/1	75/24/1
Single Kernel: Hardness	28.1	30.2	33.2	30.1	30.6	31.1	34.5	32.8	33.9
Weight (mg)	38.8	39.4	35.7	38.5	34.4	36.6	33.2	37.7	33.9
Diameter (mm)	2.77	2.77	2.67	2.75	2.56	2.69	2.57	2.75	2.58
Sedimentation (cc)	11.3	13.7	17.3	13.6	11.3	15.2	11.6	16.3	11.7
Falling Number (sec)	327	337	355	337	348	314	301	336	327
FLOUR DATA:									
Lab Mill Extraction (%)	73.6	73.9	72.4	73.5	74.0	75.0	77.2	75.1	75.2
Color: L*	92.4	92.2	92.3	92.3	92.1	91.9	91.6	92.1	92.0
a*	-2.2	-2.1	-2.0	-2.1	-2.0	-1.9	-1.9	-2.4	-2.3
b*	8.3	8.1	8.1	8.2	7.9	7.0	6.9	8.0	7.6
Protein (%) 14%/0% moisture basis	7.3/8.5	8.5/9.9	10.3/12.0	8.4/9.8	8.0/9.3	8.9/10.3	8.8/10.2	9.0/10.7	9.3/10.9
Ash (%) 14%/0% moisture basis	0.42/0.49	0.41/0.48	0.36/0.42	0.40/0.47	0.39/0.45	0.39/0.45	0.35/0.41	0.51/0.59	0.49/0.57
Wet Gluten (%)	16.2	22.2	30.1	21.7	20.8	23.6	15.8	23.4	22.7
Gluten Index	93	74	12	69	9	58	63	63	45
Falling Number (sec)	361	347	389	359	388	358	325	368	361
Amylograph Viscosity 65 g (BU)	434	509	523	487	546	393	298	515	491
Starch Damage (%)	3.1	3.2	3.1	3.2	2.8	4.5	4.7	4.5	3.8
SRC: GPI	0.56	0.56	0.60	0.56	0.48	0.57	0.49	0.56	0.49
Water/50% Sucrose	52/88	54/91	54/98	53/91	53/88	53/103	50/96	57/103	54/95
5% Lactic Acid / 5% Na ₂ CO ₃	89/72	95/75	107/75	95/74	76/66	104/78	82/73	104/81	83/76
DOUGH PROPERTIES:									
Farinograph: Peak Time (min)	1.3	2.3	3.0	2.2	1.5	2.4	1.6	2.2	1.6
Stability (min)	3.2	2.6	3.1	2.8	1.2	2.8	1.5	2.8	1.5
Absorption (%)	49.9	51.8	53.5	51.5	49.9	53.8	52.8	53.9	52.6
Alveograph: P (mm)	34	40	43	42	31	37	26	40	28
L (mm)	48	84	95	70	54	90	80	109	81
P/L Ratio	0.71	0.48	0.45	0.60	0.57	0.41	0.33	0.38	0.36
W (10 ⁻⁴ J)	54	89	105	84	45	85	45	100	50
Extensograph: Resistance (BU)	241	207	227	225	128	161	74	173	93
(45 min) Extensibility (cm)	13.8	16.3	17.5	14.1	14.3	16.8	16.8	18.0	17.5
Area (cm ²)	51	52	59	49	28	41	18	47	24
BAKING EVALUATION:									
Sponge Cake: Volume (cc)	1126	1102	1125	1114	1176	1184	1233	1227	1232
Score	47	44	49	46	50	48	49	47	48
Cookie: Diameter (cm)	9.3	8.8	8.7	9.0	9.5	8.4	8.5	8.6	8.9
Spread Ratio (width/height)	11.5	10.3	8.9	10.4	12.2	8.3	9.1	9.9	11.2
Pan Bread: Bake Absorption (%) ¹			58.7						
Crumb Grain and Texture (1-10) ¹			5.5						
Loaf Volume (cc) ¹			744						
CHINESE SOUTHERN-TYPE STEAMED BREAD EVALUATION:									
Specific Volume (ml/g)	1.8	2.2	2.5	2.1	2.1	1.9	2.1	2.1	2.3
Total Score	65.7	67.4	68.9	67.1	66.0	67.7	64.8	68.2	66.0
PRODUCTION OF 3 STATES (%)	33	49	18	100	100	100	100	100	100

*Protein Range: Low, <9.0%; Medium, 9.0 - 10.5%; High, >10.5%.

¹Bread Bake for High Protein SW only

SOFT WHITE

EXPORT CARGO DATA

SOFT WHITE	EXPORT CARGO DATA	
	2016	2015
WHEAT GRADE DATA:		
Test Weight (lb/bu)	62.0	60.9
(kg/hl)	81.5	80.1
Damaged Kernels (%)	0.1	0.1
Foreign Material (%)	0.0	0.1
Shrunken & Broken (%)	0.7	1.3
Total Defects (%)	0.8	1.5
Grade	1 SW	1 SW
WHEAT NON-GRADE DATA:		
Dockage (%)	0.3	0.3
Moisture (%)	9.4	9.0
Protein (%) 12%/0% moisture basis	10.1/11.5	10.9/12.4
Ash (%) 14%/0% moisture basis	1.28/1.49	1.36/1.58
1000 Kernel Weight (g)	38.8	34.1
Kernel Size (%) Ig/md/sm	87/12/0	74/25/1
Single Kernel: Hardness	29.0	28.9
Weight (mg)	41.8	34.9
Diameter (mm)	2.81	2.59
Sedimentation (cc)	15.8	17.2
Falling Number (sec)	317	369
FLOUR DATA:		
Lab Mill Extraction (%)	74.2	71.8
Color: L*	92.0	92.1
a*	-1.8	-1.9
b*	7.0	7.2
Protein (%) 14%/0% moisture basis	8.8/10.2	9.4/11.0
Ash (%) 14%/0% moisture basis	0.46/0.53	0.45/0.52
Wet Gluten (%)	22.1	25.6
Gluten Index	68	65
Falling Number (sec)	350	389
Amylograph Viscosity 65 g (BU)	377	558
Starch Damage (%)		
SRC: GPI		
Water/50% Sucrose		
5% Lactic Acid / 5% Na ₂ CO ₃		
DOUGH PROPERTIES:		
Farinograph: Peak Time (min)	2.5	2.5
Stability (min)	3.5	3.6
Absorption (%)	53.4	52.6
Alveograph: P (mm)	43	41
L (mm)	88	101
P/L Ratio	0.49	0.41
W (10 ⁻⁴ J)	101	113
Extensograph: Resistance (BU)		
(45 min) Extensibility (cm)		
Area (cm ²)		
BAKING EVALUATION:		
Sponge Cake: Volume (cc)	1138	1212
Score	43	42
Cookie: Diameter (cm)	8.3	8.3
Spread Factor (width/height)		
Pan Bread: Bake Absorption (%) ¹		
Crumb Grain and Texture (1-10) ¹		
Loaf Volume (cc) ¹		
CHINESE SOUTHERN-TYPE STEAMED BREAD EVALUATION:		
Specific Volume (ml/g)		
Total Score		
SAMPLE COUNT:	60	90



Pastries



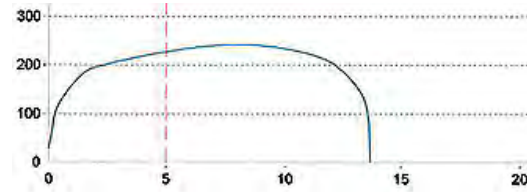
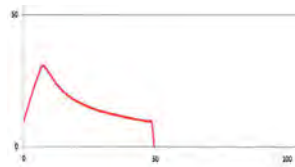
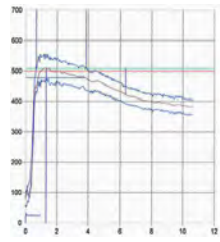
Cookies (Biscuits)

FARINOGRAMS*

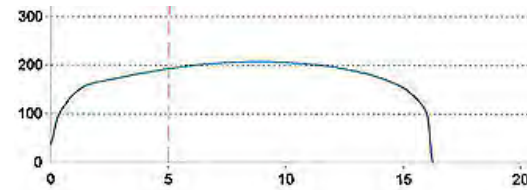
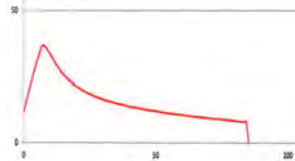
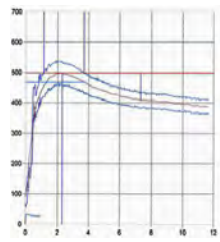
ALVEOGRAMS*

EXTENSOGRAMS*

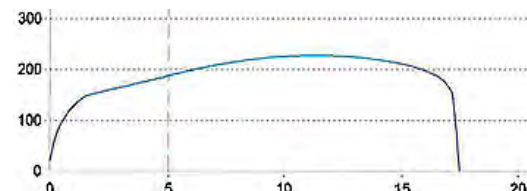
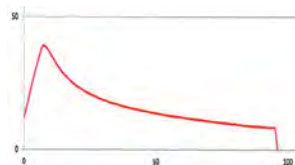
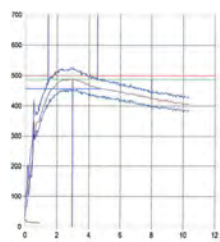
**LOW
PROTEIN**



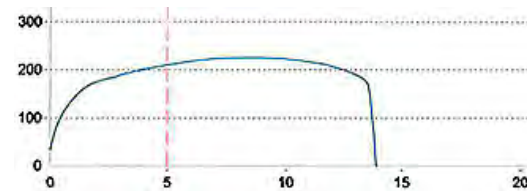
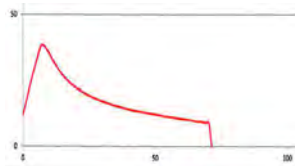
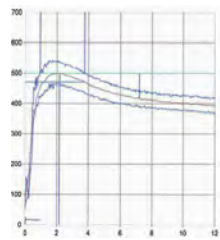
**MEDIUM
PROTEIN**



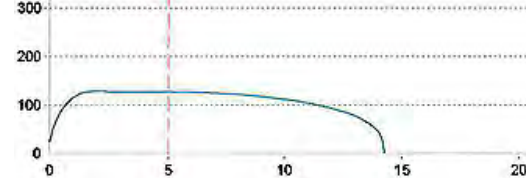
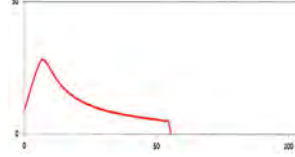
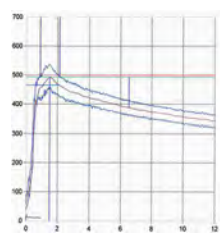
**HIGH
PROTEIN**



**AVERAGE
PROTEIN**



CLUB



*Representing 2017 Composite Average

SOFT RED WINTER

WEATHER AND HARVEST: Soft red winter wheat (SRW) is grown over a wide area of eastern United States. The area seeded to SRW in fall 2016 for the 2017 harvest is estimated by USDA at 5.6 million acres (2.3 million hectares), down from the year prior and well-below the 5-year average. The reduced area is attributed mainly to choices made by growers based on commodity prices. The 2017 SRW production, estimated at 7.9 million metric tons (MMT), is down from 9.4 MMT in 2016 and is well below the 5-year average. However, USDA estimates that the total SRW supply (excluding imports) for 2017/18 is slightly higher than 2016/17 because of large 2017/18 beginning stocks.

Planting proceeded at a slightly slower than normal pace in fall 2016. However, the crop was in good condition by late fall with more than 90% of winter wheat rated fair to excellent in five of the six SRW survey states where wheat crop conditions are reported by USDA. While some of the southeastern region was dry through the winter months, ample rain in March through early June provided adequate moisture for crop development. The beginning of SRW harvest was delayed somewhat by rain, but once started, harvest progressed rapidly.

WHEAT AND GRADE DATA: When analysis results are weighted by estimated state production, the average grade of all samples collected for the 2017 SRW harvest survey is U.S. No. 2. The weighted average test weight is 59.1 lb/bu above the 5-year average and the 58.6 lb/bu average of 2016. The Gulf Port average of 59.2 lb/bu is similar to the 2016 average and above the 5-year average of 58.6 lb/bu. The East Coast test weight average of 58.6 lb/bu is above both last year and the 5-year average. The Gulf dockage value

of 0.3% is lower than any recorded in the previous five years. Other grade factors, as well as moisture and dockage for both areas are similar to or better than the 5-year averages.

The Composite average wheat protein content of 9.5% (12% moisture basis) is similar to last year and only slightly below the 5-year average of 9.8%. The 2017 East Coast and Gulf Port protein averages are similar. However, the East Coast average protein of 9.4% is below the region's 2016 and 5-year averages, while the Gulf Port average of 9.5% is above the region's 2016 average of 9.1% and slightly below its 5-year average of 9.7%. The Composite average falling number of 319 sec is below 2016 but above the 5-year average and indicates a generally sound crop. Fewer than 20% of samples had a falling number below 300 sec in 2017, and only 4 of 270 were below 250 sec. The Composite DON average of 0.4 ppm is below the 2016 value of 0.6 ppm and well-below the 5-year average of 1.3 ppm, indicating that the crop sampled is relatively free of DON. The East Coast value of 0.3 ppm and the Gulf Port value of 0.3 ppm are both below last year's values and 5-year averages.

FLOUR AND BAKING DATA: The Composite, East Coast and Gulf Port Buhler laboratory mill flour extraction averages are all above 2016 values, but below the respective 5-year averages. The Composite farinograph peak and absorption values are similar to 5-year averages, but the stability value of 2.2 min is slightly shorter than last year and the 5-year average. The Gulf Port peak and stability averages of 1.3 min and 2.4 min, respectively, are similar to last year and the 5-year averages, while the East Coast peak and stability values of 1.2 min and 1.7 min are both shorter than last year and the 5-year averages.

**270
SAMPLES**

Collected from elevators in 18 reporting areas.

Great Plains Analytical Laboratory in Kansas City, MO, collected the samples and conducted the quality analyses.

Test weight, moisture, protein, thousand kernel weight, wheat ash and falling number were determined on each sample. The remaining tests were determined on 18 composite samples. Results were weighted by estimated production for each reporting area and combined into Composite, East Coast and Gulf Port averages. Gulf Port States and East Coast states are highlighted on the map on page 39. The survey was expanded this year to include Alabama and Tennessee. The methods are described in the Analysis Methods section of this booklet.

ABOUT SRW WHEAT

Low protein content, soft endosperm, red bran, weak gluten. Used in pastries, cakes, cookies, crackers, pretzels and flat breads. Can also be used for blending.

The Composite and Gulf Port alveograph W values of 91 and 93, respectively, are higher than the 5-year averages of 80 and 79. The other Composite, East Coast and Gulf Port alveograph values are all similar to the respective 5-year averages, given the variability of alveograph analysis. The Composite and Gulf Port cookie spread ratios are lower than last year and the 5-year

averages. Average loaf volumes are all similar to last year and the 5-year averages.

SUMMARY: Although reduced planted area decreased 2017 SRW production, the crop had a generally favorable growing season and harvest conditions for both East Coast and Gulf Port states. Test weight is well above average and

dockage is below average. The entire crop in the states sampled is largely free of sprout damage, and DON values are all below last year and the 5-year averages. Buyers are encouraged to review their quality specifications to ensure that their purchases meet their expectations.

SOFT RED WINTER PRODUCTION

for the major producing states (million metric tons)

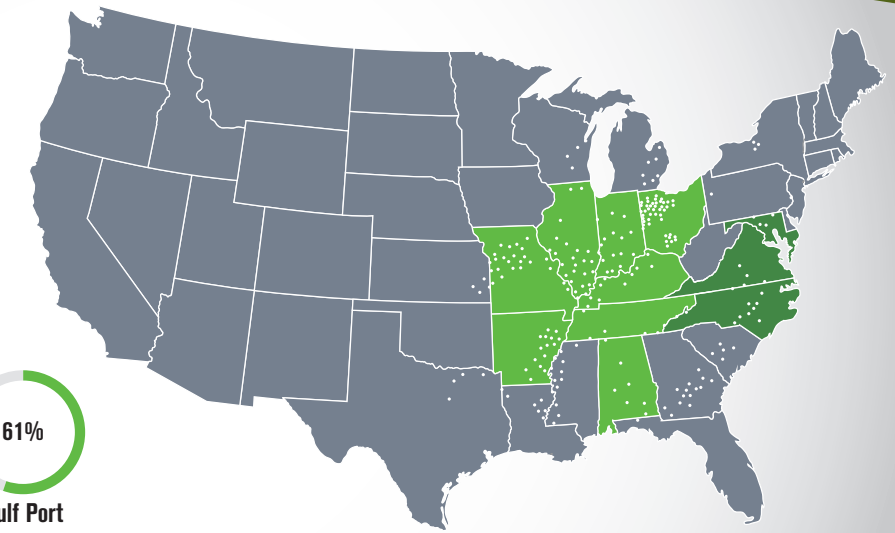
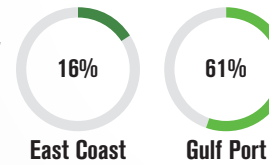
	2017	2016	2015	2014	2013
Alabama	0.2	0.3	0.4	0.4	0.5
Arkansas	0.2	0.2	0.4	0.7	1.0
Georgia	0.1	0.1	0.2	0.3	0.6
Illinois	1.0	0.9	0.9	1.2	1.5
Indiana	0.5	0.6	0.5	0.7	0.9
Kentucky	0.6	0.9	0.9	1.0	1.2
Maryland	0.4	0.5	0.5	0.5	0.5
Michigan	0.5	0.8	0.7	0.7	0.8
Missouri	1.0	1.1	0.9	1.2	1.5
North Carolina	0.6	0.4	0.8	1.2	1.4
New York	0.2	0.2	0.2	0.1	0.2
Ohio	0.9	1.2	0.9	1.1	1.2
Pennsylvania	0.3	0.3	0.3	0.3	0.3
Tennessee	0.5	0.7	0.7	0.9	1.1
Virginia	0.3	0.3	0.4	0.5	0.5
Wisconsin	0.3	0.5	0.4	0.4	0.4
Surveyed-States Total*	6.1	7.0	7.2	9.3	11.4
Sixteen-State Total	7.5	9.0	8.9	11.1	13.7
Total SRW Production	7.9	9.4	9.8	12.4	15.5

Based on USDA crop estimates as of September 29, 2017.

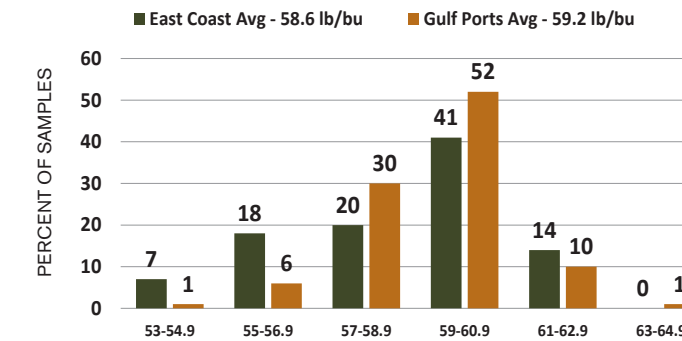
*Eleven states denoted by italics were surveyed accounting for 77% of 2017 SRW production.

11 STATES SURVEYED
77%
OF TOTAL SRW PRODUCTION REPRESENTED

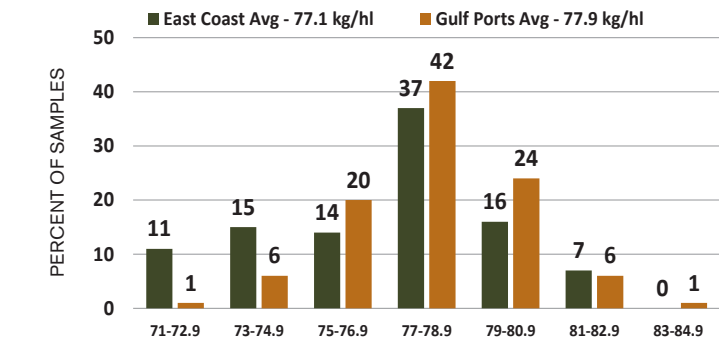
Percentage of total U.S. SRW production by export tributary region.



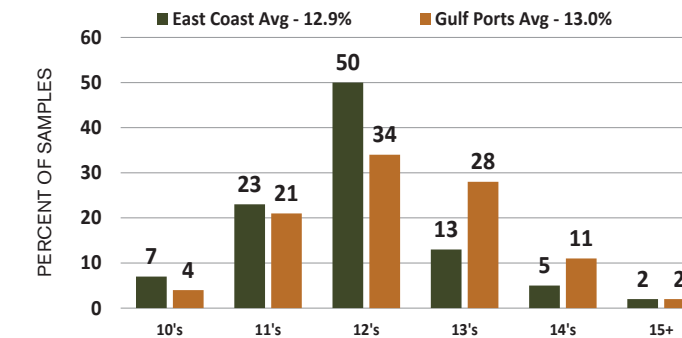
TEST WEIGHT Pounds/Bushel



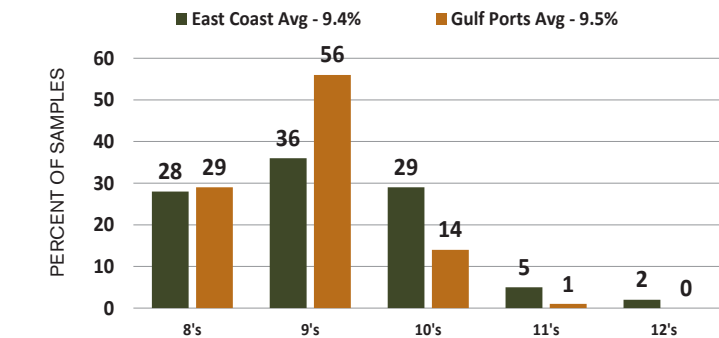
HECTOLITER WEIGHT Kilograms/Hectoliter



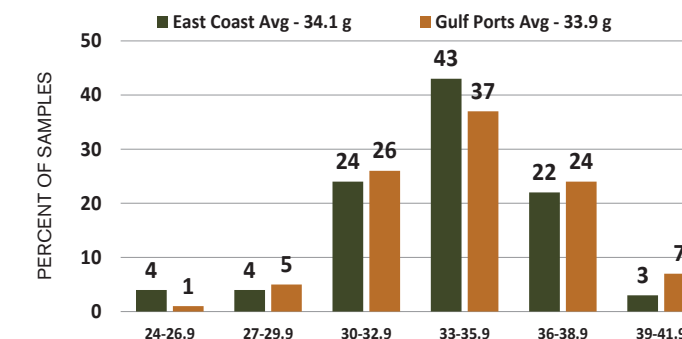
WHEAT MOISTURE Percent



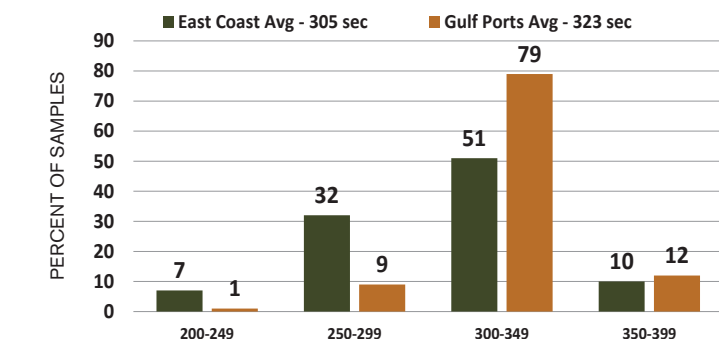
PROTEIN (12% MB) Percent



1000 KERNEL WEIGHT Grams



FALLING NUMBER Seconds



Pastries

SOFT RED WINTER

HARVEST DATA

SOFT RED WINTER	COMPOSITE AVERAGE			EAST COAST*			GULF PORTS*		
	5-YEAR AVERAGE			5-YEAR AVERAGE			5-YEAR AVERAGE		
	2017	2016	AVERAGE	2017	2016	AVERAGE	2017	2016	AVERAGE
WHEAT GRADE DATA:									
Test Weight (lb/bu)	59.1	58.6	58.4	58.6	56.0	57.7	59.2	59.3	58.6
(kg/hl)	77.7	77.2	76.9	77.1	73.8	76.0	77.9	78.0	77.2
Damaged Kernels (%)	1.1	0.8	1.7	1.6	1.7	1.6	1.0	0.5	1.7
Foreign Material (%)	0.1	0.1	0.1	0.0	0.3	0.2	0.1	0.1	0.1
Shrunken & Broken (%)	0.5	0.5	0.5	0.5	0.7	0.5	0.4	0.5	0.5
Total Defects (%)	1.6	1.4	2.4	2.1	2.7	2.3	1.5	1.1	2.3
Grade	2 SRW	2 SRW	2 SRW	2 SRW	3 SRW	3 SRW	2 SRW	2 SRW	2 SRW
WHEAT NON-GRADE DATA:									
Dockage (%)	0.4	0.5	0.6	0.4	0.6	0.6	0.3	0.4	0.5
Moisture (%)	13.0	12.4	12.9	12.9	12.8	12.9	13.0	12.2	12.9
Protein (%) 12%/0% moisture basis	9.5/10.7	9.4/10.7	9.8/11.1	9.4/10.7	10.4/11.8	10.1/11.5	9.5/10.8	9.1/10.3	9.7/11.0
Ash (%) 14%/0% moisture basis	1.45/1.68	1.46/1.70	1.48/1.72	1.44/1.67	1.55/1.80	1.48/1.72	1.45/1.68	1.44/1.67	1.48/1.72
1000 Kernel Weight (g)	34.0	32.3	32.7	34.1	31.0	33.5	33.9	32.7	32.5
Kernel Size (%) lg/md/sm	88/12/00	83/16/01	84/15/01	88/11/01	80/19/01	84/15/01	87/13/00	84/15/01	84/15/01
Single Kernel: Hardness	23.7	24.8	22.3	21.8	20.5	18.6	24.2	25.9	23.1
Weight (mg)	35.7	34.9	33.4	36.4	34.1	33.9	35.5	35.1	33.3
Diameter (mm)	2.63	2.61	2.63	2.65	2.61	2.64	2.63	2.61	2.63
Sedimentation (cc)	12.2	12.1	12.5	11.2	15.2	13.5	12.4	11.3	12.2
Falling Number (sec)	319	330	306	305	320	310	323	332	305
DON (ppm)	<0.5	0.6	1.3	0.8	1.1	1.0	<0.5	0.5	1.4
FLOUR DATA:									
Lab Mill Extraction (%)	68.9	67.3	70.9	68.2	66.9	70.9	69.1	67.5	70.9
Color: L*	92.2	90.6	92.0	92.2	90.4	92.2	92.2	90.6	91.9
a*	-2.3	-2.1	-2.7	-2.4	-2.1	-2.8	-2.3	-2.1	-2.7
b*	8.4	9.3	8.3	8.6	9.5	8.5	8.4	9.3	8.3
Protein (%) 14%/0% moisture basis	7.7/9.0	7.6/8.8	8.2/9.6	8.1/9.4	8.4/9.8	8.5/9.9	7.6/8.9	7.4/8.6	8.1/9.5
Ash (%) 14%/0% moisture basis	0.44/0.52	0.43/0.50	0.45/0.52	0.44/0.51	0.44/0.51	0.45/0.52	0.44/0.52	0.43/0.50	0.45/0.52
Wet Gluten (%)	21.3	21.3	21.8	22.4	23.2	22.5	21.0	20.8	21.6
Gluten Index	76	88	83	78	85	82	75	88	83
Falling Number (sec)	307	330	304	299	320	312	309	332	303
Amylograph Viscosity 65 g (BU)	536	588	442	445	488	405	561	614	451
Starch Damage (%)	5.1	4.4	4.8	5.3	4.3	4.5	5.0	4.4	4.8
SRC: GPI	0.59	0.61	0.58	0.54	0.61	0.58	0.59	0.60	0.58
Water / 50% Sucrose	63/129	53/100	55/106	69/125	54/101	57/107	61/130	54/97	56/104
5% Lactic Acid / 5% Na ₂ CO ₃	130/89	106/75	108/80	119/97	108/76	109/81	128/89	104/75	107/80
DOUGH PROPERTIES:									
Farinograph: Peak Time (min)	1.3	1.4	1.4	1.2	1.7	1.5	1.3	1.3	1.4
Stability (min)	2.2	2.7	2.6	1.7	2.6	2.6	2.4	2.7	2.6
Absorption (%)	53.2	52.6	52.9	53.6	53.5	53.2	53.1	52.4	52.8
Alveograph: P (mm)	41	37	36	41	39	36	41	36	36
L (mm)	89	96	89	83	111	93	90	92	87
P/L Ratio	0.46	0.38	0.41	0.49	0.35	0.39	0.45	0.39	0.41
W (10 ⁻⁴ J)	92	86	80	87	97	83	93	83	79
Extensograph: Resistance (BU)	179	213	NA	166	200	NA	183	216	NA
(45 min) Extensibility (cm)	15.7	15.7	NA	16.0	17.1	NA	15.6	15.3	NA
Area (cm ²)	50	59	NA	46	61	NA	51	58	NA
BAKING EVALUATION:									
Cookie: Diameter (cm)	8.7	10.5	NA	8.6	10.4	NA	8.7	10.5	NA
Spread Ratio (width/height)	8.8	9.6	9.4	7.7	9.2	9.2	9.1	9.7	9.5
Pan Bread: Bake Absorption (%)	54.9	54.6	NA	55.4	55.6	NA	54.8	54.4	NA
Crumb Grain and Texture (1-10)	5.1	5.4	5.1	5.3	4.9	5.1	5.1	5.5	5.1
Loaf Volume (cc)	720	718	703	731	743	724	718	711	698
PRODUCTION OF 11 STATES (%):	100			21			79		

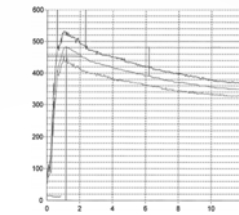
*East Coast - Maryland, Virginia and North Carolina; Gulf Ports - Alabama, Arkansas, Illinois, Indiana, Kentucky, Missouri, Ohio and Tennessee

SOFT RED WINTER

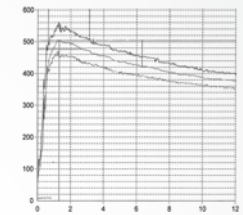
EXPORT CARGO DATA

SOFT RED WINTER	EXPORT CARGO DATA	
	2017	2016
	WHEAT GRADE DATA:	
Test Weight (lb/bu)	59.1	59.2
(kg/hl)	77.8	77.9
Damaged Kernels (%)	1.3	2.2
Foreign Material (%)	0.1	0.1
Shrunken & Broken (%)	0.9	0.9
Total Defects (%)	2.3	3.0
Grade	2 SRW	2 SRW
WHEAT NON-GRADE DATA:		
Dockage (%)	0.7	0.7
Moisture (%)	12.3	12.3
Protein (%) 12%/0% moisture basis	9.7/11.0	9.4/10.7
Ash (%) 14%/0% moisture basis	1.45/1.68	1.38/1.61
1000 Kernel Weight (g)	30.9	30.7
Kernel Size (%) lg/md/sm	83/16/1	82/16/1
Single Kernel: Hardness	23.9	
Weight (mg)	34.5	
Diameter (mm)	2.6	
Sedimentation (cc)	11.8	10.8
Falling Number (sec)	308	325
DON (ppm)		1.3
FLOUR DATA:		
Lab Mill Extraction (%)	65.7	67.7
Color: L*	92.1	90.9
a*	-2.2	-2.1
b*	8.1	8.7
Protein (%) 14%/0% moisture basis	7.5/8.7	7.6/8.9
Ash (%) 14%/0% moisture basis	0.43/0.50	0.43/0.50
Wet Gluten (%)	20.4	20.2
Gluten Index	93	94
Falling Number (sec)	288	330
Amylograph Viscosity 65 g (BU)	513	494
Starch Damage (%)		
SRC: GPI		
Water / 50% Sucrose		
5% Lactic Acid/5% Na ₂ CO ₃		
DOUGH PROPERTIES:		
Farinograph: Peak Time (min)	1.5	1.3
Stability (min)	2.9	2.2
Absorption (%)	52.6	53.3
Alveograph: P (mm)	41	50
L (mm)	80	78
P/L Ratio	0.51	0.64
W (10 ⁻⁴ J)	97	115
Extensograph: Resistance (BU)		
(45 min) Extensibility (cm)		
Area (cm ²)		
BAKING EVALUATION:		
Cookie: Diameter (cm)		
Spread Ratio (width/height)	8.4	8.9
Pan Bread: Bake Absorption (%)		
Crumb Grain and Texture (1-10)	5.4	5.1
Loaf Volume (cc)	727	713
SAMPLE COUNT:	10	76

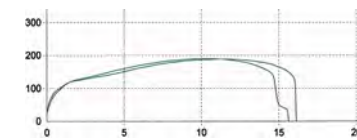
FARINOGRAMS* EAST COAST



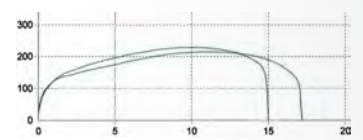
GULF



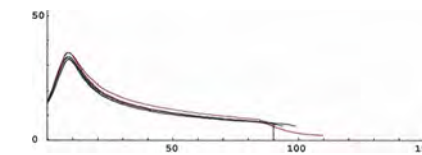
EXTENSOGRAMS* EAST COAST



GULF



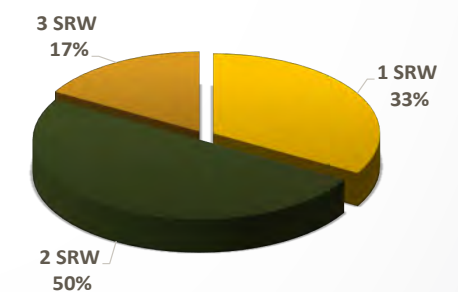
ALVEOGRAM* EAST COAST & GULF



*REPRESENTING 2017 COMPOSITE AVERAGE

SRW GRADE DISTRIBUTION

(Based on 18 composite samples)



EXPORT CARGO SURVEY

The export cargo data represent 86 sublot samples provided by USDA's Federal Grain Inspection Service for Export for crop years 2016 and 2015 from Gulf of Mexico and East Coast ports. Grade data are the official grades on the individual sublots. Great Plains Analytical Laboratory conducted the milling and baking analyses.

ANALYSIS METHODS

The harvest and cargo samples for each class are evaluated using the following methods. Flour or semolina produced as described in “Laboratory Milling Extraction” is analyzed to provide flour, semolina and end-use product data.

WHEAT AND GRADE DATA

GRADE: Official U.S. Standards for Grain.

DOCKAGE: Official USDA procedure using the Carter Dockage Tester.

MOISTURE: HRW, HRS, SW, HW – Official USDA NIR method; Durum – AACC 44-11.01 (Motomco Moisture Meter) and AACC 44-15.02 (air oven method); SRW – AACC 44-15.02.

TEST WEIGHT: AACC 55-10.01; test weight is converted to hectoliter weight: for durum – kg/hl = lb/bu x 1.292 + 0.630, for other classes – kg/hl = lb/bu x 1.292 + 1.419.

PROTEIN: HRW, HRS, SW, HW – AACC 39-25.01 (NIR method); all other classes

– AACC 46-30.01 (Dumas combustion nitrogen analysis or CNA method).

SINGLE KERNEL CHARACTERIZATION: AACC 54-31.01 using Perten SKCS 4100.

SEDIMENTATION: HRS, HRW (Midwestern), SRW, SW, HW – AACC 56-61.02; Durum – AACC 56-70.01; HRW California (CA) – AACC 56-63.01.

1000 KERNEL WEIGHT: HRS, Durum, SRW – based on a 10 gram (g) clean wheat sample counted by an electronic counter; SW, HW – based on the average weight of three 100-kernel samples expressed on a 14% moisture basis (mb); HRW – average of SKCS kernel weight times 1000.

ASH: AACC 08-01.01 expressed on a 14% mb.

FALLING NUMBER: AACC 56-81.03; average value is a simple mean of sample results.

DON: All analysis is on ground wheat. HRS, Durum – gas chromatograph with electron

capture detector as described in the Journal of the Association of Official Analytical Chemists 79,472 (1996). SRW, HRW (CA) – Neogen ELISA; HRW (Midwestern) – Charm ROSA DonQ2 Quantitative Test.

VITREOUS KERNELS: HRS and Durum – percentage by vitreous kernels weight handpicked from a 15 g clean wheat sample.

KERNEL SIZE DISTRIBUTION: HRS, Durum (Northern) – Cereal Foods World (Cereal Science Today) 5:(3), 71 (1960). HRW (Midwestern), SW, HW, SRW – Wheat is sifted with a RoTap sifter using Tyler No. 7 (2.82 mm) and No. 9 (2.00 mm) screens. HRW (CA), Durum (Pacific Southwest) – uses U.S. Standard Sieves No. 7 (2.80 mm) and No. 10 (2.00 mm). Kernels remaining on the No. 7 screen are “Large,” passing through the No. 7 screen but not the No. 9 or No. 10 (HRW (CA), Pacific Southwest Durum) are “Medium,” and passing through the No. 9 or No. 10 screen are “Small.”

distilled water with paddle (HRS) or pins (other classes).

EXTENSOGRAPH: AACC 54-10.01, modified 45-min and 135-min rest for HRS, HRW, HW; 45-min rest for SW and SRW.

STARCH DAMAGE: SRW – AACC 76-30.02; all other classes – AACC 76-33.01 (SDmatic method).

SOLVENT RETENTION CAPACITY (SRC): SW, HW – SRC machine (Chopin); all other classes – AACC 56-11.02.

FALLING NUMBER: AACC 56-81.03; average value is a simple mean of sample results.

FARINOGRAPH: AACC 54-21.02 (Constant Flour Method) with 50 g bowl. Absorption is reported on 14% mb.

ALVEOGRAPH: AACC 54-30.02. SW, HW – Alveolab.

AMYLOGRAPH: AACC 22-10.01 modified to use 65 g flour (14% mb) and 450 ml

FLOUR DATA

LABORATORY MILLING EXTRACTION:

Samples are cleaned and tempered according to AACC 26-10.02. All samples other than HRW (CA) are milled with standardized mill settings on a Buhler laboratory mill using these methods: SW – AACC 26-31.01; HRW (Midwestern), SRW, HRS and HW – AACC 26-21.02. SRW – uses a 183 micron sieve. HRW (CA) is milled on a Brabender® Quadrumat Senior mill using the Brabender® procedure. All extraction rates are calculated against total products on an “as is” moisture basis.

ASH: AACC 08-01.01, reported on 14% mb.

COLOR: HRW (Midwestern) – Minolta method using Minolta Chroma Meter CR-110 with Granular-Materials Attachment; HRW (CA) – CR-210; HRS, SW, SRW, HW – CR-410 with Granular-Materials Attachment CR-A50. CIE 1976 L*a*b* color system: L* indicates white-black, a* – red-green and b* – yellow-blue.

PROTEIN: HRW, HRS – AACC 39-10.01 (NIR method); all other classes – AACC 46-30.01 (Dumas CNA method).

WET GLUTEN AND GLUTEN INDEX: HRW, HRS, SRW, HW – AACC 38-12.02; SW – AACC 38-12.02 (water reduced from 4.8 to 4.2 ml).



Photo courtesy of Wheat Marketing Center

SEMOLINA DATA

LABORATORY MILLING EXTRACTION: Samples are milled using a modified Buhler laboratory mill with identical settings and equipped with Miag laboratory purifiers, as described by Vasiljevic and Banasik 1980: Quality Testing Methods for Durum Wheat and Its Products, pp. 64-72, Dept. of Cereal Chemistry and Technology, NDSU, Fargo, ND. Roll gaps are modified to (in mm): B1-0.762; B2-0.305; B3-0.254; R1-0.102; B4-0.076; B5-0.038. Extraction rates are calculated against total products on an “as is” moisture basis. Procedure is derived from AACC 26-41.02 based on research showing improved correlation between laboratory and commercially milled semolina quality.

END-USE PRODUCT DATA

MIDWESTERN HRW: AACC 10-10.03 (pup loaf method). 100 g flour at 14% mb with optimized water absorption is mixed to optimum development with other ingredients (6% sugar, 3% shortening, 1.5% salt, 1.0% instant dry yeast, 50 ppm ascorbic acid and 0.25% malted barley flour) in a 100g pin mixer with head speed of 100 to 125 rpm. The dough is fermented for 60 min with two punches, then molded, panned and proofed for 60 min before baking at 425 F for 18 min. Loaf volume is measured immediately after baking by rapeseed displacement. Crumb grain and texture are evaluated on a 0 to 6 scale, which for this booklet is converted to a 1 to 10 scale.

CA HRW: AACC 10-10.03 producing two loaves per batch using 6% sugar, 3% shortening, 1.5% salt, 1.5% active dry yeast, 50 ppm ascorbic acid, 0.10% malted barley flour in a 200 g Swanson pin mixer with head speed of 100 to 120 rpm and 120-min fermentation. Loaf volume is measured 1 hour after baking. Grain and texture are scored on a scale of 1 to 10 with higher numbers indicating preferred quality.

SRW: AACC 10-10.03 producing two loaves per batch using dry yeast and ascorbic acid. After mixing, the dough is divided into two equal portions, fermented for 160 min, molded and panned in “pup loaf” pans before proofing and baking. Loaf volume is measured immediately after baking by rapeseed displacement. SRW Cookie Spread Ratio - AACC 10-50.05.

HRS: AACC 10-09.01 (long fermentation method) modified: 15 SKB units fungal amylase/100 g flour; 1% instant dry yeast; 10 ppm ammonium phosphate; 2% added shortening. Dough is mechanically punched, molded and baked in “Shogren-type” pans. Scoring is based on a 1 to 10 scale with higher numbers indicating preferred quality attributes.

SW: Cookie diameter – AACC 10-52.02. Sponge cake volume* and score - Japanese standard

ASH: AACC 08-01.01 on 14.0% mb.

COLOR: Minolta Method using Minolta Chroma Meter CR-410 (Northern) or CR-210 (Pacific Southwest) with Granular-Materials Attachment.

PROTEIN: AACC 46-30.01 (Dumas CNA method).

WET GLUTEN AND GLUTEN INDEX: AACC 38-12.02 (Glutomatic procedure).

SPECKS: Sample is pressed under a 3-inch x 4-inch glass plate and the specks within a one-inch square marked on the plate are counted. Average of three determinations is expressed as specks per 10 square centimeters.

method described by Nagao in Cereal Chemistry 53:977-988, 1976. Sponge cake control flour is western white. SW High Protein – AACC 10-10.03 with 180-min fermentation for bread*

DURUM: Pasta is made using the laboratory procedure described by Walsh, Ebeling and Dick, Cereal Foods World: 16: (11) 385 (1971). Water (Pacific Southwest – adjusted to optimum hydration based on P-value from Alveograph test; Northern – 32%) is added to semolina and mixed in a Hobart mixing bowl for 5 min. Semolina-water mixture is extruded using a DeMaco laboratory pasta extruder. Northern – Spaghetti is dried using modified Buhler high-temperature drying cycle as described by Debbouz, Pitz, Moore and D'Appolonia, Cereal Chemistry: 72 (1):128-131. Pacific Southwest – Spaghetti is dried using modified Buhler low-temperature drying cycle as described by P. Yue, P. Rayas-Duarte, and E. Elias, Cereal Chemistry 76(4):541-547. Color scores are determined by the procedure described by Walsh, Macaroni Journal 52: (4) 20 (1970), using a Minolta Color Difference Meter (Northern CR-410, Pacific Southwest CR-210). Higher values (scale 1 to 12) are preferred. Cooked weight, cooking loss and firmness are determined by AACC 16-50.01.

HW BAKING: AACC 10-10.03 with 180-min fermentation.*

HW NOODLE: Two noodle types are prepared from each HW flour: Chinese raw noodles and Chinese wet noodles. Raw noodle formula: flour 100%, salt 1.2% and distilled water 28%; wet noodle formula: flour 100%, salt 2%, K₂CO₃ 0.45%, Na₂CO₃ 0.45% and distilled water 32%. Noodle sheet color is measured twice on each side of a dough sheet that is resting atop a two other dough sheets to ensure color consistency. This is done for two dough sheets (eight readings total) using a Minolta CR-410 Chroma Meter; the mean value is reported.

For wet noodles, noodle sheet color is measured on both uncooked and parboiled (for 1.5 min)

MIXOGRAPH: Northern – 10 g of semolina are mixed in a 10 g bowl with 5.8 ml of distilled water to give maximum dough consistency. Pacific Southwest – 35 g of semolina are mixed in a 35 g bowl with optimum water absorption using the formula $y=1.5 \cdot X+43.6$. X=semolina protein (14% mb). The spring setting is 8 (Northern) and 10 (Pacific Southwest). A classification incorporating peak height and general curve characteristics is assigned based on comparison with eight reference mixograms; the higher the classification number, the stronger the curve type.

sheets. Cooking yield is percent of weight gain after cooking for 5 min for raw noodles and 1.5 min for wet noodles, rinsing in 26°-27° C water and draining. Sensory noodle color stability score is a total score of noodle color rated at 2 and 24 hours against a control sample (an assigned score of 7) and is reported based on a 1 to 10 scale; higher scores indicate better color stability. Noodle texture is determined on five strands of cooked noodles with a strand cross-cut dimension of 2.5 x 1.2 mm for raw noodles, W x T; 1.7 x 1.6 mm for wet noodles, W x T using a Stable Micro Systems TA.XT2 Texture Analyzer. Firmness indicates noodle bite; springiness indicates the degree of recovery after first bite; cohesiveness is a measure of noodle structure disruption during first bite; and chewiness is a product of firmness, cohesiveness and springiness (firmness x cohesiveness x springiness) and thus is a single parameter that incorporates the three textural parameters. Higher textural parameter values are generally more desirable for Chinese-style noodles.

CHINESE STEAMED BREAD: Two types of steamed breads are prepared: Chinese southern-type steamed breads from each of the SW and club wheat flours and Asian-type steamed breads from each of the HW flours. Chinese southern-type formula: flour 100%, sugar 15%, shortening 4%, baking powder 1.2%, instant yeast 0.8%, nonfat dry milk powder 3% and water 39 to 43%; Asian-type formula: flour 100%, instant yeast 1.5%, sugar 12%, shortening 2% and water 42.5 to 45%. Yeast is dissolved in water before use. All steamed breads are prepared using no-time dough methods (Wheat Marketing Center protocols). The total product score comprises volume*, external characteristics, internal characteristics, eating quality and flavor. Each property is rated compared with a control sample. The control flour is scored 70.

*Finished Product Volume for SW bread, sponge cake and steamed bread and HW bread and steamed bread: Laser light using a Tex Vol Instrument (BVM-L370).

UNITED STATES

WHEAT GRADES AND GRADE REQUIREMENTS

GRADING FACTORS	GRADES U.S. NO.				
	1	2	3	4	5
MINIMUM LIMITS:					
Test Weight (lb/bu)					
Hard Red Spring or White Club	58.0	57.0	55.0	53.0	50.0
All other classes and subclasses	60.0	58.0	56.0	54.0	51.0
Test Weight (kg/hl)					
Hard Red Spring or White Club	76.4	75.1	72.5	69.9	66.0
Durum	78.2	75.6	73.0	70.4	66.5
All other classes and subclasses	78.9	76.4	73.8	71.2	67.3
MAXIMUM PERCENT LIMITS:					
Defects					
Damaged kernels:					
- Heat (part of total)	0.2	0.2	0.5	1.0	3.0
- Total	2.0	4.0	7.0	10.0	15.0
Foreign material	0.4	0.7	1.3	3.0	5.0
Shrunken and broken kernels	3.0	5.0	8.0	12.0	20.0
Total ¹	3.0	5.0	8.0	12.0	20.0
Wheat of Other Classes²					
Contrasting classes	1.0	2.0	3.0	10.0	10.0
Total ³	3.0	5.0	10.0	10.0	10.0
Stones	0.1	0.1	0.1	0.1	0.1
MAXIMUM COUNT LIMITS (ALL GRADES):					
Other material (1000 gram sample)					
Animal filth			1		
Castor beans			1		
Crotalaria seeds			2		
Glass			0		
Stones			3		
Unknown foreign substance			3		
Total ⁴			4		
Insect-damaged kernels in 100 grams					31

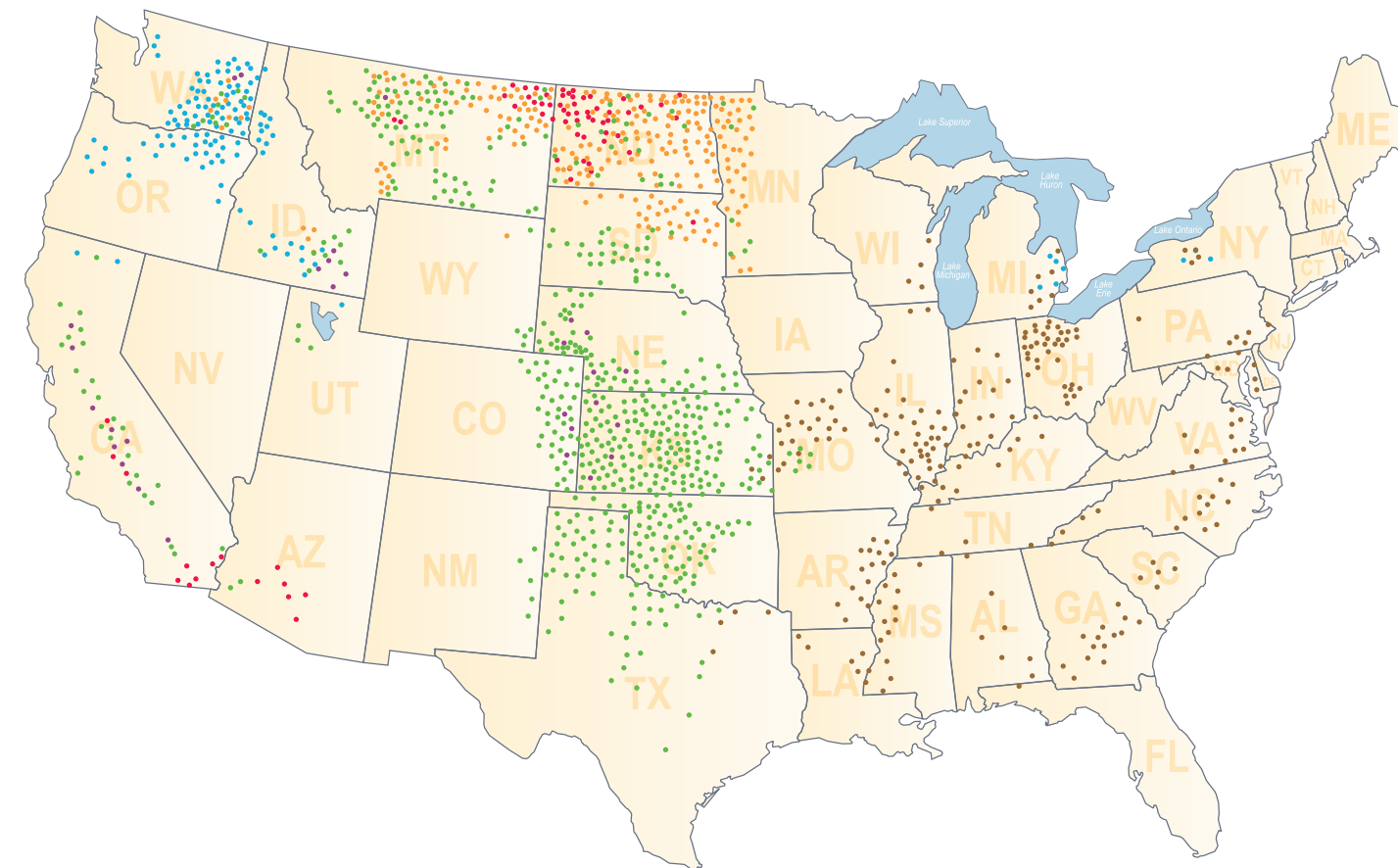
U.S. Sample grade:
Wheat that:
(a) Does not meet the requirements for U.S. Nos. 1, 2, 3, 4, 5; or
(b) Has a musty, sour or commercially objectionable foreign odor (except smut or garlic odor); or
(c) Is heating or of distinctly low quality.

Notes:
1. Includes damaged kernels (total), foreign material, and shrunken and broken kernels.
2. Unclassed wheat of any grade may contain not more than 10.0% of wheat of other classes.
3. Includes contrasting classes.
4. Includes any combination of animal filth, castor beans, crotalaria seeds, glass, stones, or unknown foreign substance.

Wheat Equivalents:		Metric Equivalents:	
1 bushel =	60 pounds (27.2 kg)	1 pound =	0.4536 kg
36.74 bushels =	1 metric ton	1 metric ton (MT) =	2204.6 lbs
37.33 bushels =	1 long ton	1 short ton (2000 lbs) =	0.9072 MT, or 907.2 kg
33.33 bushels =	1 short ton	1 long ton (2240 lbs) =	1.0160 MT, or 1016.0 kg
3.67 bushels =	1 quintal	1 metric ton =	10 quintals
tons/ha =	0.06725 bu/acre	1 hectare =	2.47 acres
durum kg/hl =	lbs/bu x 1.292 + 0.630	1 acre =	0.40 hectare
other wheat kg/hl =	lbs/bu x 1.292 + 1.419	1 hundredweight =	100 pounds or 45.36 kg



U.S. WHEAT... THE WORLD'S MOST RELIABLE CHOICE



HARD RED WINTER



Medium to high protein, medium hard endosperm, red bran, medium gluten content, mellow gluten. Used in pan breads, Asian noodles, hard rolls, flatbreads and general-purpose flour.

SOFT RED WINTER



Low protein content, soft endosperm, red bran, weak gluten. Used in pastries, cakes, cookies, crackers, pretzels and flat breads. Can also be used for blending.

HARD WHITE



Medium to high protein content, hard endosperm, white bran. Used in Asian noodles, whole wheat or high extraction flour applications, pan breads and flat breads.

HARD RED SPRING



Highest protein content, hard endosperm, red bran, strong gluten, high water absorption. Used in pan breads, hearth breads, rolls, croissants, bagels, hamburger buns, pizza crust and for blending.

SOFT WHITE

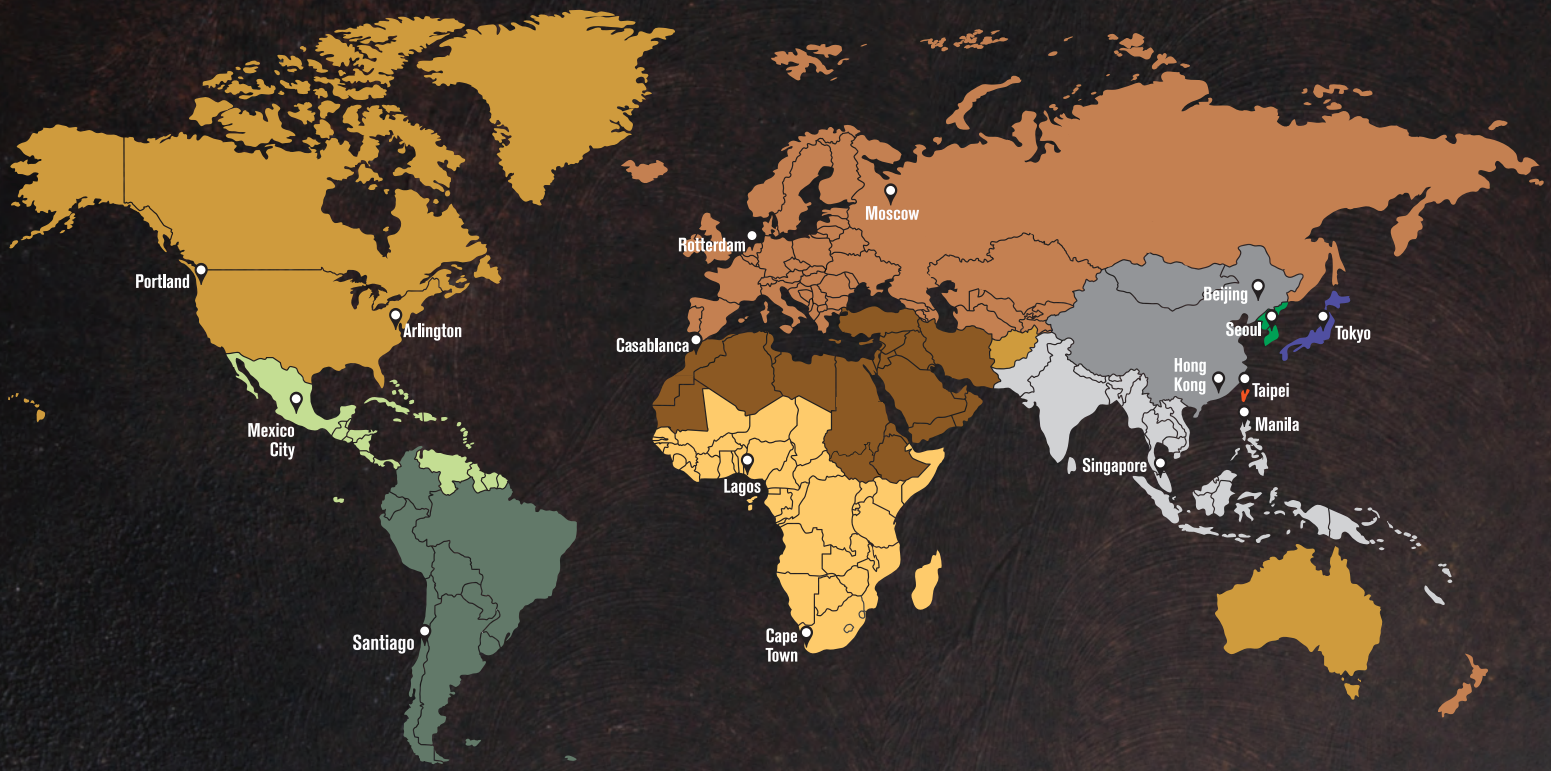


Low protein, low moisture wheat, soft endosperm, white bran, weak gluten. Used in pastries, cakes, biscuits, crackers, flat breads, Asian-style noodles and snack foods.

DURUM



Hardest of all wheats, high protein content, yellow endosperm, white bran. Used to make pasta, couscous and some Mediterranean breads.



U.S. WHEAT ASSOCIATES

WORLD HEADQUARTERS

3103 10th Street, North, Suite 300
Arlington, VA 22201

TELEPHONE (202) 463-0999

FAX (703) 524-4399

EMAIL infoARL@uswheat.org

WEST COAST U.S. OFFICE

1200 NW Naito Parkway, Suite 600
Portland, OR 97209

TELEPHONE (503) 223-8123

FAX (503) 223-5026

EMAIL infoPDX@uswheat.org

WWW.USWHEAT.ORG



U.S. Wheat Associates (USW) is the industry's market development organization working in more than 100 countries. Its mission is to "develop, maintain and expand international markets to enhance wheat's profitability of U.S. wheat producers and its value for their customers." The activities of USW are made possible by producer checkoff dollars managed by 17 state wheat commissions and through cost-share funding provided by USDA's Foreign Agricultural Service. For more information, visit www.uswheat.org.

Nondiscrimination and Alternate Means of Communications Statement

U.S. Wheat Associates prohibits discrimination in all its programs and activities on the basis of race, color, religion, national origin, gender, marital or family status, age, disability, political beliefs or sexual orientation. Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact U.S. Wheat Associates at 202-463-0999 (TDD/TTY - 800-877-8339, or from outside the U.S.- 605-331-4923). To file a complaint of discrimination, write to Vice President of Finance, U.S. Wheat Associates, 3103 10th Street, North, Arlington, VA 22201, or call 202-463-0999. U.S. Wheat Associates is an equal opportunity provider and employer.
© 2017 U.S. Wheat Associates. All rights reserved. The U.S. Wheat Associates logo is a registered mark of U.S. Wheat Associates.