

Analyzing New Wheat Crop

When crop quality varies, relying on an ash curve can help smooth things out.

As the 2013 Hard Red Winter (HRW) harvest nears completion, several mills are working through the annual transition to new crop wheat.

Each year, flour millers adjust to differences that come with each harvest, and this year will be no different and may even present some unique challenges.

Subtle changes in the wheat each year can impact flour extraction significantly and ultimately affect the profitability of the milling company and flour functionality. That, in turn, affects the miller's ability to meet customer needs.

HRW Harvest Progress

As of late July, HRW harvest was completed in Texas, Oklahoma and Kansas and was nearly complete in Nebraska and Colorado. Location, location, and location have become the story regarding key quality characteristics in this year's harvest.

Overall, production of HRW for 2013 will be lower than last year. Preliminary results indicate test weight to be about a pound lighter and protein about 0.75% higher than last season.

However, test weight and protein are widely variable due to the ongoing drought in the majority of Midwest wheat production areas mixed with some timely but sporadic rains.

In Kansas, the quality and millability reports reflect significant differences in the wheat grown in the eastern half of the state compared to the western half.

Comprehensive HRW Crop Survey

Plains Grains, Inc., Stillwater, OK (405-744-9333), is a private, nonprofit wheat marketing organization that conducts a comprehensive HRW wheat crop survey each year helping to connect wheat producers to international and domestic flour millers.

The survey results, as of July 26, 2013, illustrate the differences in important wheat quality characteristics related to location.

Map 1 below represents the distribution of protein content in

Management



Mark Fowler

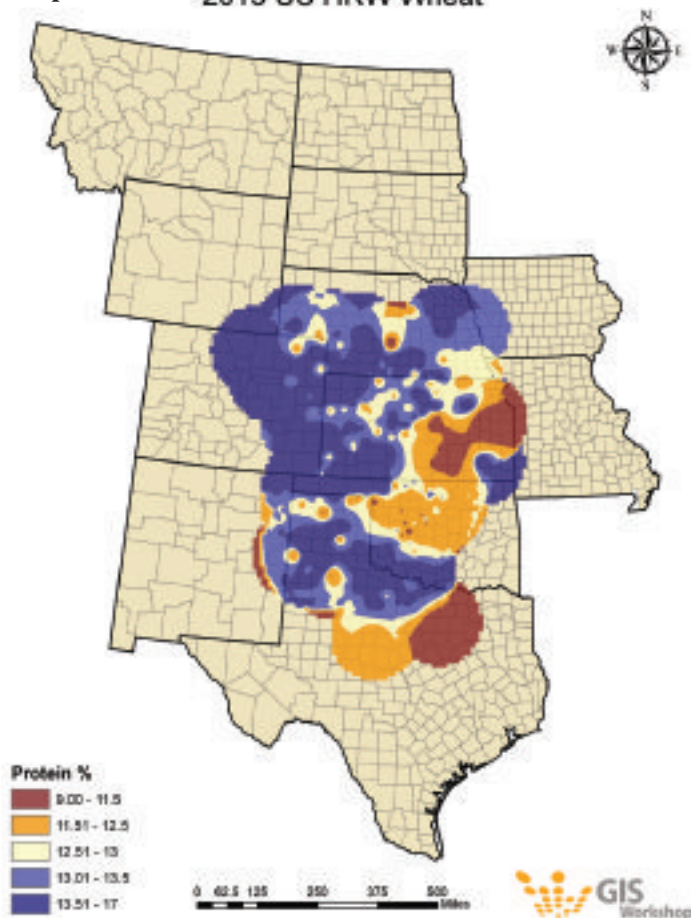
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Map 1

2013 US HRW Wheat





Variable quality is prevalent in this year's Hard Red Winter crop.

the 2013 HRW wheat crop in Kansas and the surrounding states. The impact of the environment and growing conditions on the quality and quantity of wheat harvested is well-documented.

Drought-stressed wheat tends to be harder with a smaller kernel size and decreased moisture content.

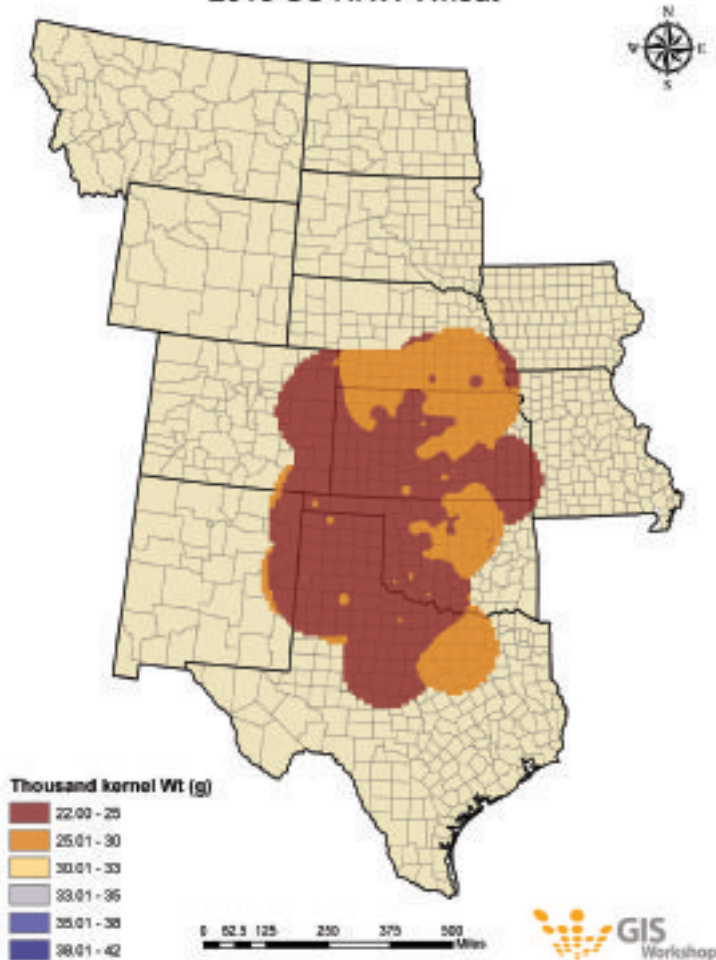
This year illustrates this impact well. As expected, higher-protein-content wheat was harvested in the regions hardest hit by the current drought plaguing large areas of the Midwest.

Wheat grown in the eastern regions of Kansas and Oklahoma, however, received some timely rain and cooler temperatures just weeks prior to harvest allowing for better kernel fill and larger kernel size but lower protein content.

Map 2 below illustrates the correlation of kernel size as measured by the thousand-kernel weight (TKW) and protein content seen in this year's crop. ▶

Map 2

2013 US HRW Wheat



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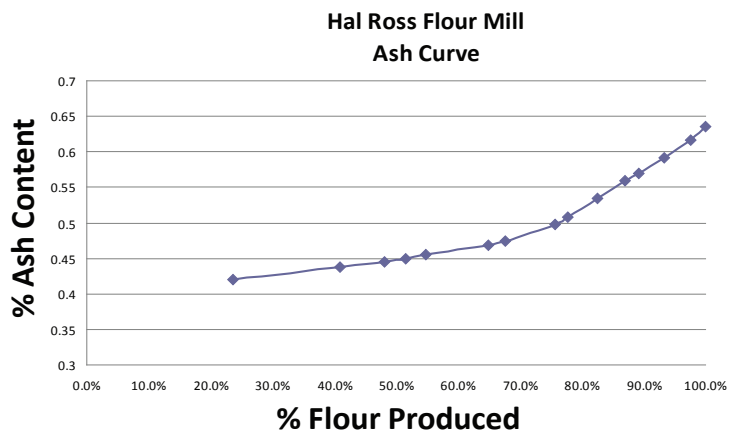
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An example of a cumulative attribute curve, more commonly known as an ash curve, which is considered to be one of the best quantitative analyses of the milling process.

The preliminary data on TKW are of concern in some regions. For example, according to annual wheat quality surveys conducted by U.S. Wheat Associates, Arlington, VA, an average TKW is between 28 and 30 grams. This year, reports of TKW below 24 grams are common.

The small kernel size will be a problem, similar to and potentially worse than the 2011 crop year depending on the wheat's origin and degree of blending.

Impact of Kernel Size

Adjusting to the smaller wheat kernels begins in the wheat

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cleaning and conditioning process.

When wheat is received by elevators during harvest, it is stored depending on available space and blended to meet contract specifications.

While blending wheat is important to deliver a consistent product to the customer, wheat blending by protein content may result in a wide range of kernel size this year.

Closely monitoring and adjusting the cleaning process to avoid significant loss of small kernels will be necessary for most high-protein HRW blends.

Wheat originating from the drought-impacted areas also may be much lower in moisture and, as a result, impact wheat conditioning.

When possible, a longer tempering time may help to improve extractions and maximize flour moistures.

Measuring Quality of Flour Streams

In the mill, the annual new crop transition is the ideal time to review performance.

One of the best quantitative analysis tools for the milling process is the cumulative attribute curve, commonly referred to as an ash curve (see example above).

This curve can be used to analyze and compare several components of individual flour streams from the milling process including protein, color, or moisture, in addition to the traditional ash measurement.

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Cumulative Attribute Curve

When evaluating the performance of wheat flour from a milling process, few analytical tools tell as much about the flour and mill flow diagram as a cumulative attribute curve.

The objective of the cumulative attribute curve is to describe mathematically and illustrate graphically the distribution of a specific attribute within a mixture.

The curve provides a method of analysis that views the attribute level as a function of the components within the mixture. This makes the cumulative attribute curve an invaluable tool to evaluate the changes in mill and flour performance due to annual changes in the quality characteristics in the wheat or wheat sourced from different geographical regions.

The curve can be used to evaluate the mill performance in two key areas.

First, the most common purpose is to estimate blending ratios and stream selection for flour production. Straight grade flour is the flour produced from the mill when all the flour streams are combined into one end product.

For most mills, the ash content of this straight-run flour is between 0.52% and 0.58% at a 14% moisture basis depending heavily on the wheat type and extraction percentage.

For flour customers who prefer lower ash content in their end product, the mill must select streams to cut or remove to

a clear or low-grade flour stream.

Secondly, an ash curve helps to estimate the percentage of the flour produced that can be blended to meet customer specifications. This estimation is used for planning the production of flour, mill capacity, and run time, as well as pricing the product to the customer.

While any individual flour stream can be analyzed for its chemical and functional properties, an attribute curve only can illustrate chemical or physical properties accurately with a linear relationship such as protein or ash.

Functional dough properties such as falling number, water absorption, stability, and other mixing properties have a nonlinear relationship when blended and therefore cannot be estimated accurately by using an attribute curve calculation.

Creating an Attribute Curve

Creating an attribute curve is a relatively simple calculation but an extremely time-consuming task.

The first step is to weigh off all the flour streams in the mill. For some larger

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commercial flour mills, this could be 50 to 60 or more individual streams from individual sifter boxes.

The accuracy of this weighoff is critical, as all the analysis results will be calculated according to the ratios determined from this weighoff.

The mill must be balanced and running at its optimal, normal conditions for the attribute curve to be useful.

Milling rate, wheat moisture, break releases, and all roll settings need to be checked and double-checked before the weighoff begins.

Filters, set-off bins, and any other source that feeds stock into the milling process need to be shut off or confirmed they are in the normal operating range,

before streams are weighed off.

Waiting for about 30 days after making a full transition to the new-crop wheat also adds some assurance that the wheat is representative of the expected quality for the remainder of the year.

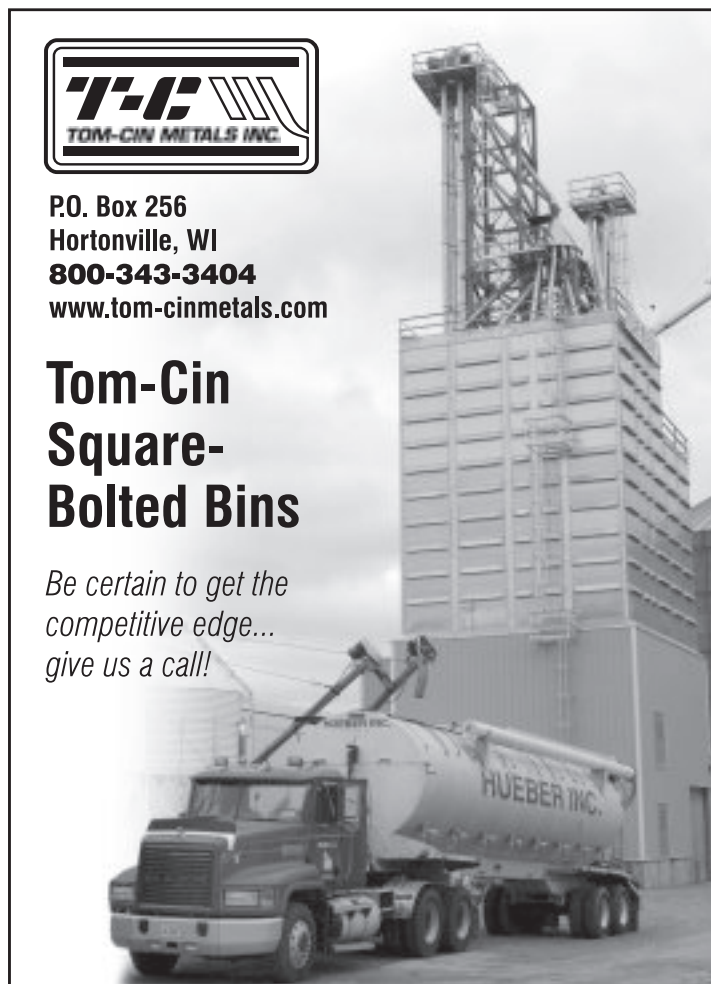
Each year, changes in average kernel size and protein content create challenges for the miller and the baker.


Adjusting to these changes in quality and flour performance require proactive communication and planning between both parties.

The faster that quality changes can be identified through mill analysis and crop surveys, the smoother it will be when making the transition to new crop.

For more information on calculating and completing a cumulative attribute curve, please contact Mark Fowler at: mfowler@ksu.edu.

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