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2011 Regional  
Crop  
Quality  
Report  
North Dakota  
and Minnesota



# 2011 Regional Barley Crop Quality Report North Dakota and Minnesota

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## Introduction

This is the 33rd annual Regional Crop Quality Report for barley grown in North Dakota and northwestern Minnesota (Figure 1). The data in this report summarizes analytical information obtained from 93 barley samples collected at farms and elevators during the 2011 barley harvest. The U.S. Department of Agriculture (USDA), North Dakota Agricultural Statistics Service, Fargo, N.D., coordinated sample collection. Grain quality evaluations were performed by the Department of Plant Sciences at North Dakota State University (NDSU).

## Weather, Growing Season and Harvest

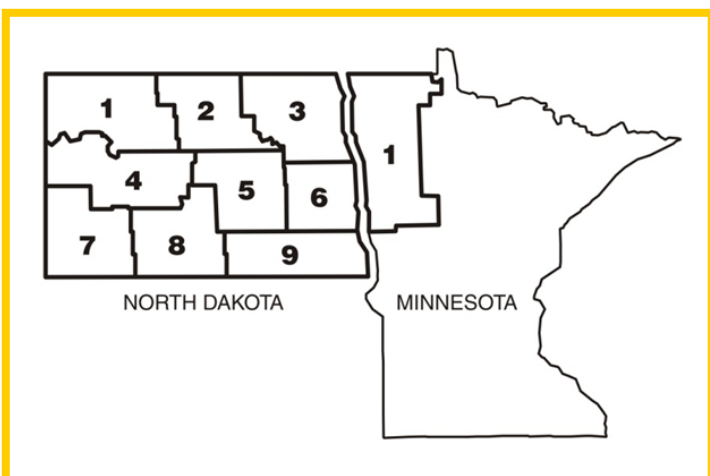
The growing season was very wet across North Dakota and Minnesota.

In North Dakota, saturated soils in the fall of 2010, record winter snowfall amounts, and excess spring precipitation led to top- and subsoil moisture levels 25 to 30 percent above 2010 levels and the 5 year average. Rainfall amounts received between April 1 and June 30, 2011 were 50 percent above normal.

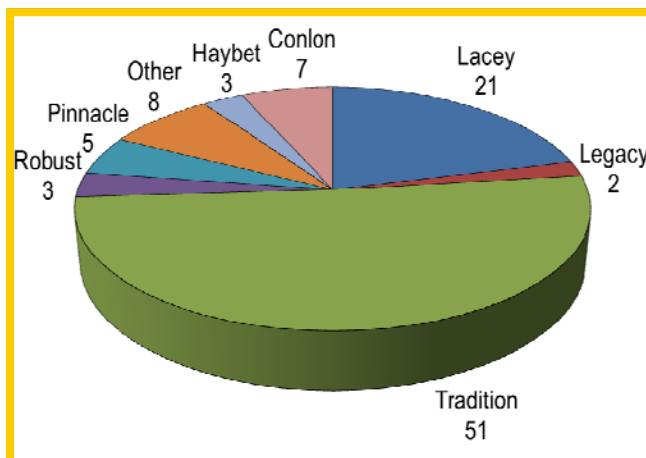
Wet conditions and flooding in northwestern Minnesota Crop Reporting District (CRD-1) and the northern districts of North Dakota (CRD -1, -2 and -3) caused damage to roads, bridges and other infrastructure. Travel to fields was impeded and this led to difficulties delivering and applying fungicides to crops.

In North Dakota, wet conditions led to record

**Figure 1. Crop Reporting Districts (CRD) in North Dakota and Minnesota**



**Figure 2. 2011 Regional Barley Variety Distribution (Percentage by Acreage)**



prevented planting, particularly in the traditionally highest barley production areas of the state. By July 15, 211.6 thousand acres of the planned barley acreage in North Dakota were reported not planted. Planted acreage in northwestern district CRD-1 was 133.0 thousand in 2010 and 43.8 thousand in 2011 with 97.8 thousand acres reported as prevented plant. A similar situation was seen in north central district CRD-2 where acreage in 2010 was 187.0 thousand and 69.1 thousand in 2011 with 71.4 thousand acres reported as prevented plant. Other areas with significant decreases in acreage were northeastern, west central and central CRDs -3, -4 and -5 which all reported more than a 30 percent decrease in planted acres and 19.5 thousand, 7.9 thousand and 6.1 thousand prevented plant acres, respectively.

## Production and Varieties

The USDA (Sept. 30, 2011) estimated 2011 barley production in North Dakota and Minnesota at 19.5 million bushels. This was a decrease of approximately 28.4 million bushels from the 2010 crop year. Decreased production in the survey region was the result of reduced acreage and yield. The two states experienced a 42 percent reduction in planted acreage and a 45 percent reduction in harvested acreage. Planted acreage fell from 805 thousand acres in 2010 to 470 thousand acres in 2011 with 87 percent of planted



Courtesy the North Dakota Barley Council

acres harvested. The five year average is 92 percent of planted acres harvested.

Yields, in both North Dakota and Minnesota, were below average in 2011. The average yield of the North Dakota crop fell from 65 bushels per acre (bu/acre) in 2010 to 47 bu/acre in 2011. The average yield of the Minnesota crop dropped from 62 bu/acre in 2010 to 51 bu/acre in 2011.

According to the USDA/National and State

Agricultural Statistics Services, Tradition was the most widely planted barley variety in the North Dakota and northwestern Minnesota survey region. The six-rowed barley varieties, Tradition, Lacey, Robust and Legacy, accounted for 51, 21, 3 and 2 percent, respectively, of barley acres planted (Figure 2).

Two rowed varieties are grown primarily in the western crop reporting districts of North Dakota. The variety Conlon was the most widely planted two-rowed

Table 1. Regional Six-Rowed Crop Quality

State and Crop Reporting District (CRD)	Dockage (%)	Moisture Content (%)	Test Weight		1000 Kernel Weight (g)	Protein Content (%)	Color Score*	Kernel Assortment**	
			(lbs/bu)	(kg/hl)				%Plump	%Thin
<b>North Dakota</b>									
CRD-1	0.5	12.6	45.7	58.8	33.6	13.2	6	75.3	4.0
CRD-2	0.6	12.6	45.8	59.0	33.4	13.4	7	73.2	3.9
CRD-3	0.4	13.2	45.8	59.0	34.9	12.5	7	79.9	3.0
CRD-4	1.0	14.2	44.7	57.5	32.2	12.8	6	69.4	5.3
CRD-5	0.7	13.7	43.3	55.7	31.8	13.4	7	70.4	5.7
<b>ND State Average</b>	<b>0.6</b>	<b>13.2</b>	<b>45.1</b>	<b>58.1</b>	<b>33.3</b>	<b>13.1</b>	<b>7</b>	<b>74.2</b>	<b>4.2</b>
<b>Minnesota</b>									
CRD-1	1.6	14.5	45.7	58.8	35.4	12.0	7	81.5	2.8
<b>MN State Average</b>	<b>1.6</b>	<b>14.5</b>	<b>45.7</b>	<b>58.8</b>	<b>35.4</b>	<b>12.0</b>	<b>7</b>	<b>81.5</b>	<b>2.8</b>
<b>Regional Average</b>	<b>0.7</b>	<b>13.3</b>	<b>45.2</b>	<b>58.2</b>	<b>33.5</b>	<b>12.9</b>	<b>7</b>	<b>75.0</b>	<b>4.1</b>

\*The lower the color score the brighter the barley (scale 1 to 10).

\*\*% Plump: kernels retained on or above a 6/64 x 3/4 inch (2.4 x 19 mm) slotted sieve.

% Thin: kernels passing through a 5/64 x 3/4 inch (2.0 x 19 mm) slotted sieve.

variety. Two-rowed barley varieties, Conlon, Pinnacle and Haybet, accounted for 7, 5 and 3 percent, respectively, of barley acres planted.

### Materials and Methods

The objective of the 2011 regional barley crop quality survey was to collect a representative number of samples from each county within the selected districts of the survey region. This number was determined from the projected barley production for each county. Due to this year's low

production, barley samples were collected only in the northern and west central districts (CRD's 1-5) of North Dakota and in the northwestern district (CRD-1) of Minnesota (Figure 1).

A total of 93 barley samples, weighing from 1 to 2 pounds each, were collected from farms and country elevators. Two- and six-rowed samples were differentiated based upon varietal identification by the grower or kernel morphology. This year, 89 six-rowed barley samples and 4 two-rowed barley samples were collected.

Figure 3.  
2011  
Regional  
Six-Rowed  
Barley Test  
Weight  
Distribution

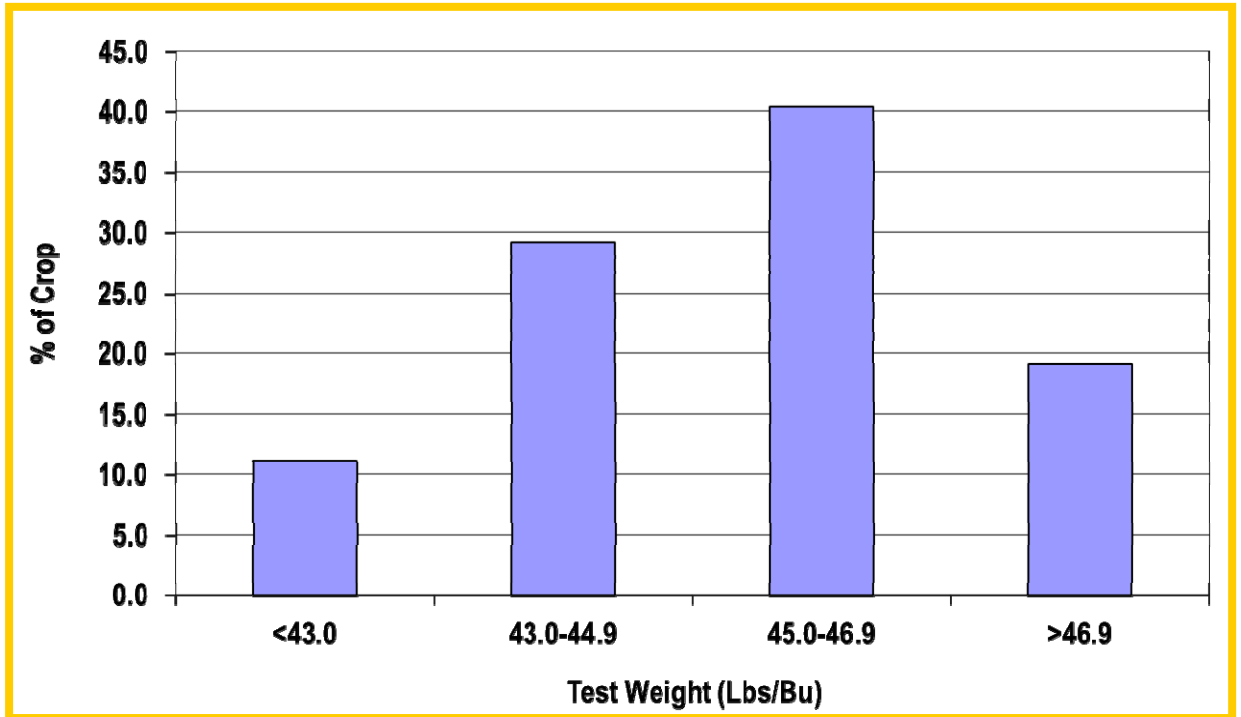


Figure 4.  
2011  
Regional  
Six-Rowed  
Barley  
Protein  
Distribution

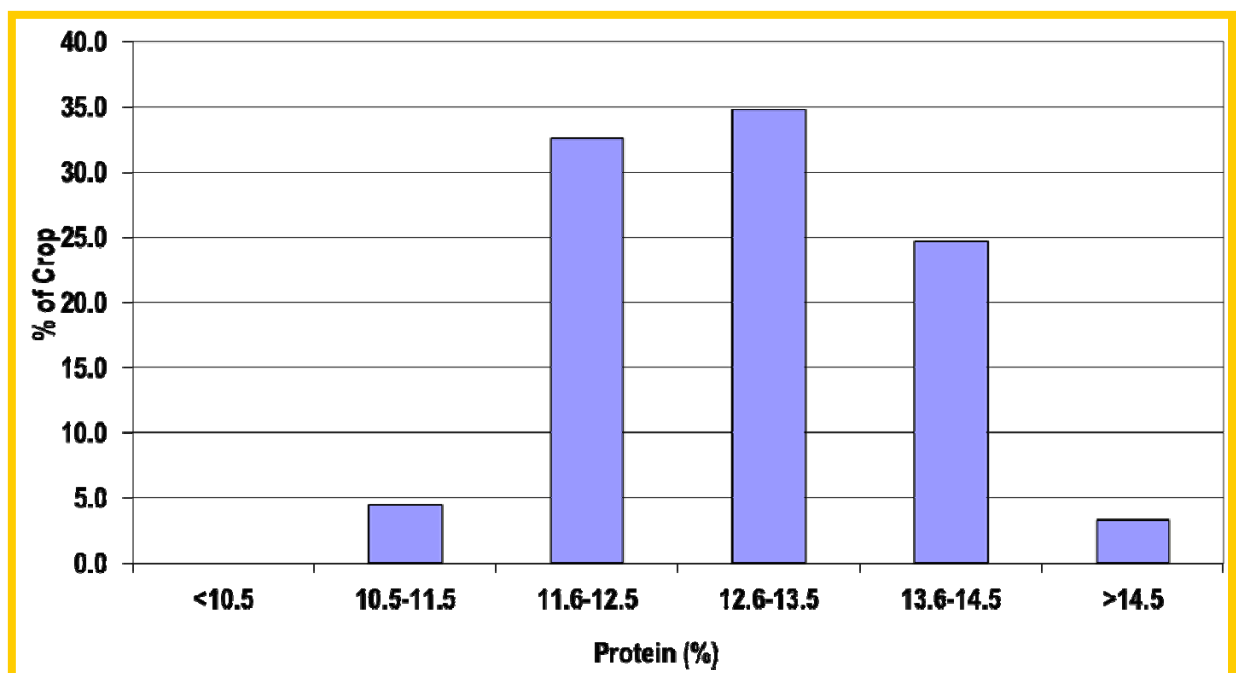


Table 2. Grade and Grade Requirements for Six-Rowed Malting Barley and Six-Rowed Blue Malting Barley

Grade	Minimum limits of-		Maximum limits of-						
	Test Weight (lbs/bu)	(kg/hl)	Suitable Malting Type (%)	Sound Barley* (%)	Damaged Kernels* (%)	Foreign Material (%)	Other Grains (%)	Skinned and Broken Kernels (%)	Thin Barley** (%)
U.S. No. 1	47.0	60.5	95.0	97.0	2.0	0.5	2.0	4.0	7.0
U.S. No. 2	45.0	57.9	95.0	94.0	3.0	1.0	3.0	6.0	10.0
U.S. No. 3	43.0	55.3	95.0	90.0	4.0	2.0	5.0	8.0	15.0
U.S. No. 4	43.0	55.3	95.0	87.0	5.0	3.0	5.0	10.0	15.0

*\*Injured-by-frost kernels and injured-by-mold kernels are not considered damaged kernels or considered against sound barley.*

*Notes: Malting barley shall not be infested, blighted, ergoty, garlicky, smutty, or contain any special grades. Upon request, malting barley varieties may be inspected and graded in accordance with standards established for the class Barley. Six-rowed Malting and Six-Rowed Blue Malting barley that does not meet the requirements for U.S. Nos. 1, 2, 3, or 4 Malting shall be graded under the Barley standards (see Table 5).*

*\*\* Use the 5/64 x 3/4 slotted-hole sieve.*

*Information from-United States Department of Agriculture Grain Inspection, Packers and Stockyards Administration Federal Grain Inspection Service Grain Inspection Handbook, Book II, Barley August 9, 2004*

Upon receipt, the initial barley moisture content was recorded and samples in excess of 13.5 percent were allowed to air-dry prior to subsequent analyses.

Prior to further analysis, all samples collected were cleaned on a Carter dockage tester. Test weight, protein, kernel assortment, 1,000 kernel weight and kernel color were determined for each of the dockage-free samples. The values for district, state and regional six-rowed barley averages represent the average of all individual sample results within their respective area.

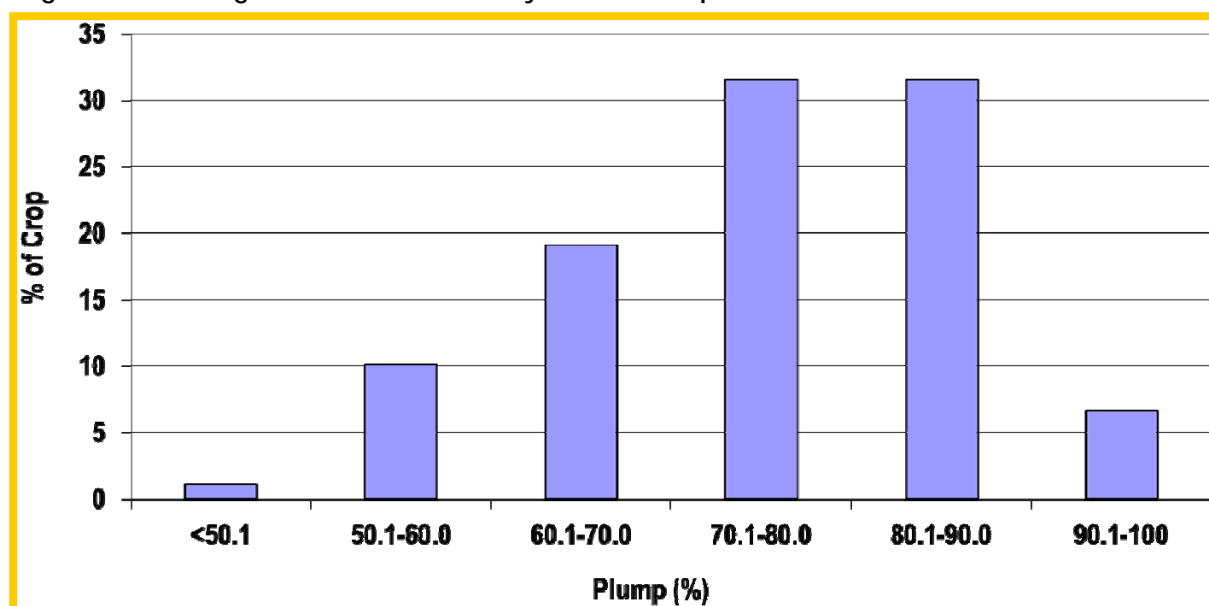
#### Crop Quality

**Test Weight.** The 2011 regional six-rowed barley

crop exhibited an average test weight of 45.2 pounds per bushel (lbs/bu) (Table 1). North Dakota and Minnesota state averages were 45.1 and 45.7 lbs/bu, respectively. District averages ranged from 43.3 to 45.8 lbs/bu. North Dakota's northern districts (CRD-1, CRD-2 and CRD-3) and Minnesota's northwestern district (CRD-1) reported average test weight at or above 45.7 lbs/bu. Test weights of individual samples ranged from 35.1 to 49.0 lbs/bu. Regionally, 60 percent of the six-rowed barley samples had test weights at or above 45 lbs/bu (Figure 3).

**Protein.** The average protein content of the 2011 regional six-rowed barley crop was 12.9 percent (Table 1).

Figure 4. 2011 Regional Six-Rowed Barley Kernel Plumpness Distribution



**Table 3. Regional (North Dakota and Minnesota) Six-Rowed Barley Crop Quality Data, 2007-2011**

Year	Samples	Moisture Content (%)	Test Weight		1000 Kernel Weight (g)	Protein Content (%)	Color Score*	Kernel Assortment**	
			(lbs/bu)	(kg/hl)				%Plump	%Thin
2011	89	13.3	45.2	58.2	33.5	12.9	7	75.0	4.1
2010	217	13.8	48.0	61.8	37.9	12.3	7	88.6	1.6
2009	236	13.7	48.5	62.4	40.3	11.9	7	91.2	1.0
2008	242	13.0	46.9	60.4	36.7	12.6	6	77.2	3.7
2007	248	12.3	46.7	60.1	35.8	12.5	5	74.7	4.2

\*The lower the color score the brighter the barley (scale 1 to 10).

\*\*% Plump: kernels retained on or above a 6/64 x 3/4 inch (2.4 x 19 mm) slotted sieve.

% Thin: kernels passing through a 5/64 x 3/4 inch (2.0 x 19 mm) slotted sieve.

The North Dakota and Minnesota state averages were 13.1 percent and 12.0 percent, respectively. The highest district average protein content (13.4 percent) was observed in North Dakota's north-central and central districts (CRD-2 and CRD-5). Minnesota's northwestern district (CRD-1) reported the lowest average protein content of 12.0 percent. Twenty-eight percent of the regional six-rowed samples tested above 13.5 percent protein (Figure 4).

**Kernel Plumpness.** The regional average kernel plumpness for the 2011 six-rowed barley crop was 75.0 percent (Table 1). Average kernel plumpness in North Dakota and Minnesota was 74.2 percent plump and 81.5 percent plump, respectively. Thirty-eight percent of the regional six-rowed barley samples exhibited kernel plumpness in excess of 80 percent plump (Figure 5). Only Minnesota's northwestern district (CRD-1) reported average kernel plumpness above 80 percent. Average kernel plumpness was lowest, 69.4 percent plump, in the west-central district (CRD-4) of North Dakota.

**1,000 Kernel Weight.** The 2011 regional six-rowed barley crop exhibited an average 1,000 kernel weight of 33.5 grams (Table 1). Average 1,000 kernel weight was highest in Minnesota's northwestern district (CRD-1) and North Dakota's northeastern district (CRD-3) at 35.4 grams and 34.9 grams, respectively. The lowest average six-rowed barley 1,000 kernel weight of 31.8 grams was observed in North Dakota's central district (CRD-5).

**Color.** Barley color score is based on a scale of 1 to 10, with a lower score indicating brighter barley. The 2011 regional six-rowed barley crop observed an average color score of 7 (Table 1). The brightest six-rowed barley (average color score of 6) was observed in North Dakota's

northwestern (CRD-1) and west central (CRD-4) districts.

**Grade.** The grade and grade requirements for six-rowed malting barley is presented in Table 2. Based on the distribution of test weight (Figure 3), 19 percent of the 2011 regional six-rowed barley crop samples displayed a test weight at least 47 lbs/bu. These samples would be eligible to receive the grade of U.S. No. 1 Six-Rowed Malting Barley. Forty percent of these samples had test weight in the grade range of U.S. No. 2 Six-Rowed Malting Barley, with test weight ranging from 45.0 lbs/bu to under 47 lbs/bu. Eleven percent of the region's samples had test weight below 43.0 lbs/bu. These samples would not receive the U.S. Malting Barley grade, but rather the lower U.S. Barley grade.

**Historical Results.** Historical six-rowed barley quality data (2007-2011) is presented in Table 3. The regional barley quality for the 2011 crop is lower than previous years. This reduced quality can be seen in lower averages for test weight (45.2 lbs/bu) and 1,000 kernel weight (33.5 grams), and higher than average protein levels (12.9 percent). The average plumpness for the 2011 crop (75.0 percent) was lower than that seen in the past two years, but was similar to that observed in 2007 and 2008.

## Resources

National Agricultural Statistics Service. 2011. Statistics by State [Online]. Available at USDA-NASS Minnesota Statistics. [http://www.nass.usda.gov/Statistics\\_by\\_State/Minnesota/index.asp](http://www.nass.usda.gov/Statistics_by_State/Minnesota/index.asp) (Verified 26 Oct. 2011)

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Prevented Planting Acreage Summary Report – North Dakota. 2011. Available at USDA Farm Service Agency North Dakota. [http://www.fsa.usda.gov/Internet/FSA\\_File/2011acreagereportingsummary.pdf](http://www.fsa.usda.gov/Internet/FSA_File/2011acreagereportingsummary.pdf) (Verified 26 Oct. 2011)

## Appendix 1.

### Number of Barley Samples Collected and Reported by Type and Location

Location	Six-Rowed	Two-Rowed
<b>North Dakota</b>		
CRD 1	14	1
CRD 2	21	1
CRD 3	19	0
CRD 4	9	2
CRD 5	16	0
<b>State Total</b>	<b>79</b>	<b>4</b>
<b>Minnesota</b>		
CRD 1	10	0
<b>State Total</b>	<b>10</b>	<b>0</b>
<b>Regional Total</b>	<b>89</b>	<b>4</b>

## CONVERSIONS

Quart (QT)			
Wet	x 0.946	=	Liters (L)
Dry	x 1.101	=	Liters
Gallons (GAL)			
Wet	x 3.785	=	Liters
Wet	x 0.038	=	Hectoliters (HL)
Dry	x 4.404	=	Liters
Dry	x 0.044	=	Hectoliters
Bushels (BU)	x 0.352	=	Hectoliters
Acres (A)	x 0.405	=	Hectares (HA)
Pounds (LB)	x 0.454	=	Kilograms (KG)
Miles (MI)	x 1.609	=	Kilometers (KM)
LB/BU	x 1.287	=	KG/HL
BU/A	x 0.870	=	HL/HA
BU/A (Barley)	x 0.054	=	MT/HA
BU (Barley*)	x 0.022	=	MT
BU (Malt*)	x 0.015	=	MT

*Standards	LB/BU	KG/BU	KG/HL	Seeds/Pound	
				Range	Average
Malt	34	15.42	43.76		
Barley	48	21.77	61.78	10,000-15,000	13,000

## Methods Employed and Definition of Terms and Symbols

**Test Weight** - Test weight was determined on dockage-free barley and was expressed in pounds per bushel. In the event sample moisture exceeded 13.5 percent, the sample was allowed to air-dry prior to test weight determination.

**Moisture** - Moisture was expressed as a percentage of total weight and was determined with a Motomco Model 919ES flow-through moisture meter.

**Protein** - Percent total protein, reported on a dry-matter basis, was determined by near infrared transmittance on a Foss Infratec 1241 grain analyzer.

**Kernel Assortment** - Barley (100 gram) kernel assortment was determined by standard ASBC method

Barley 2-C (Methods of Analysis of the American Society of Brewing Chemists, 2009) using a Eureka-Niagara sample barley grader.

**1,000 Kernel Weight** – 1,000 kernel weight was determined by ASBC method Barley-2D (Methods of Analysis of the American Society of Brewing Chemists, 2009) with an electronic kernel counter.

**Color** - Color was determined by a modification of ASBC standard method, Barley-9 (Methods of Analysis of the American Society of Brewing Chemists, 2009) using the L-value obtained from a HunterLab ColorFlex Model CFLX-45 spectrophotometer. The L-value was converted to a color score (1-10), with a score of 1 representing bright barley and a score of 10 representing dark or heavily stained barley.

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