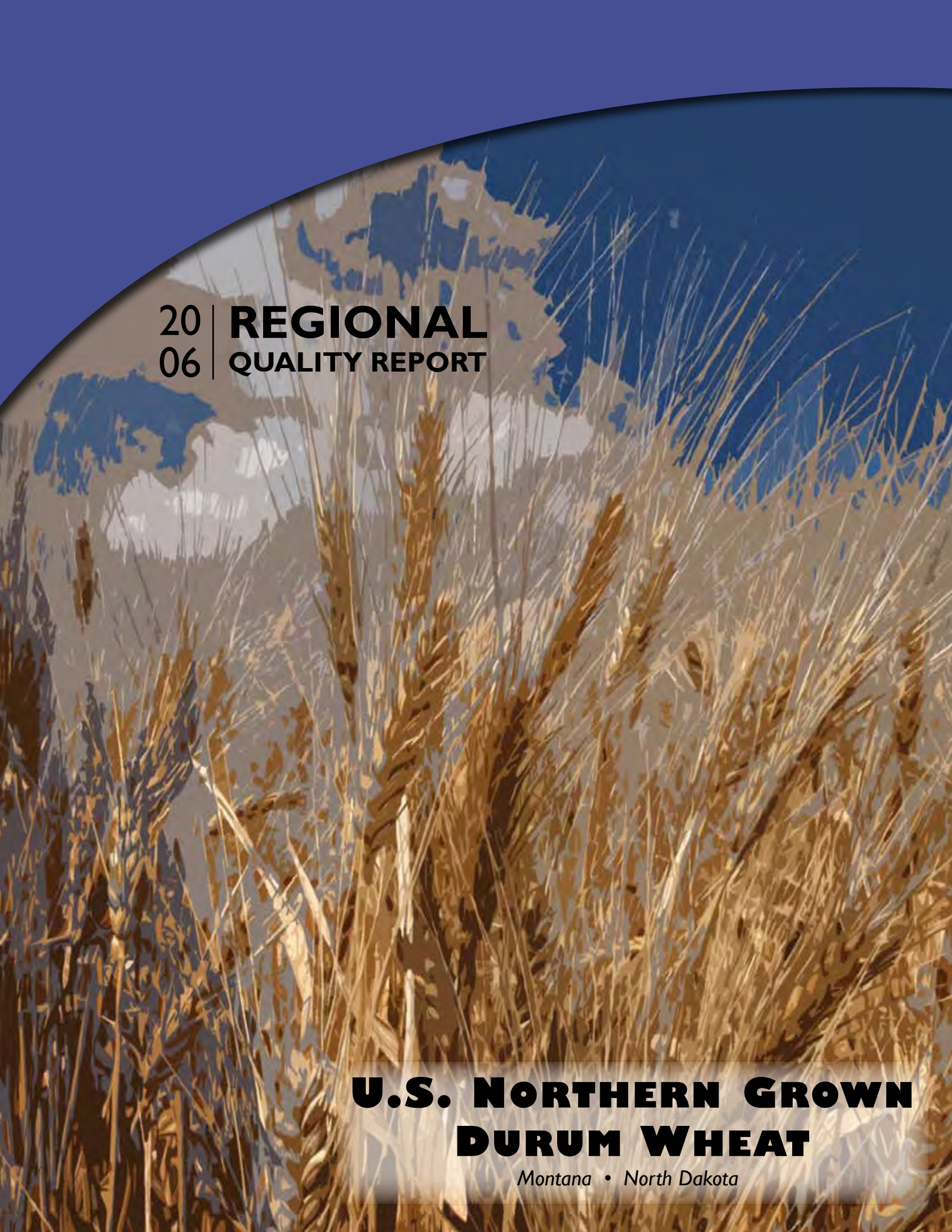

2006 REGIONAL QUALITY REPORT

# U.S. Northern Grown Durum Wheat

*Montana • North Dakota*

# Making Premium Pasta

**DURUM**—is the hardest of all wheats. Its density, combined with its high protein content and gluten strength, make durum the wheat of choice for producing premium pasta products. Pasta made from durum is firm with consistent cooking quality. Durum kernels are amber-colored and larger than those of other wheat classes. Also unique to durum is its yellow endosperm, which gives pasta its golden hue.

When durum is milled, the endosperm is ground into a granular product called semolina. A mixture of water and semolina forms a stiff dough. Pasta dough is then forced through dies, or metal discs with holes, to create hundreds of different shapes.

Durum production is geographically concentrated to the Northern Plains because it demands a special agronomic environment. The states of North Dakota and Montana in most years jointly produce 80 percent of the U.S. durum crop. Farmers in California and Arizona grow the remainder.

## 2006 Overview

The 2006 durum crop produced in North Dakota and Montana is characterized by low damage levels, low moisture, high protein and strong vitreous kernel counts, producing an end-product that exhibits enhanced gluten strength and improved spaghetti cooking quality. Reduced planted area and drought conditions, dropped regional production by 55 percent from 2005.

The average grade for the crop is a No. 2 Hard Amber Durum with 68 percent of the crop grading No. 2 HAD or better, down slightly from 70 percent last year. A regional average test weight of 59.9 pounds, just short of the needed 60 pounds for No. 1, is the sole reason the crop falls short of averaging a No. 1 grade. A dry harvest helped secure a sound crop averaging 385 seconds for falling number and 90 percent vitreous kernels. Damage levels of just 0.2 percent, are the lowest since 1999. Shrunken and broken kernels of 1.7 percent are slightly higher than last year and the five-year average due to the hot, dry conditions during crop ripening and harvest.

Overall protein content at 15.1 percent is up sharply from 13.4 percent in 2005 and the five-year average of 13.9 percent. Pasta processing attributes are very good in the 2006 crop with the most notable improvements shown in gluten strength. The average gluten index is a 57, as compared to 39 for a five-year average and 45 last year. The mixograph score remains a 6 (scale 1-8).

Enhanced cooked properties are also noted with improved cooking weight and firmness and reduced cooking loss, as compared to both

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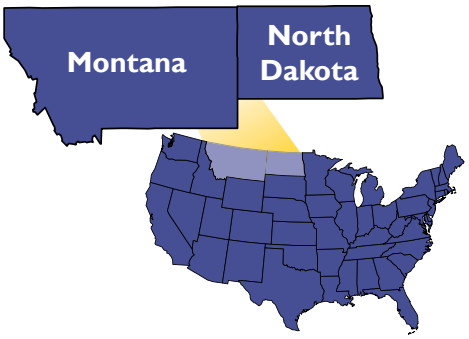
Cover photo: David Lipp, Fargo




2005 and the five-year average. As expected, semolina and total milling extractions are lower than last year but remain similar to or slightly higher than the five-year average. A contributing factor is the reduced thousand kernel weights caused by the hot, dry growing season. Pasta color is similar to the five-year average at a 9 (scale 1-12), but is rated slightly lower than last year's exceptional level of 9.4.

Buyers should be pleased with the strong quality and performance features exhibited in the 2006 crop, especially the high protein content, improved gluten properties, and overall kernel soundness. Due to some lower than normal thousand kernel weights and test weights, buyers are encouraged to use appropriate contract specifications to ensure they receive the quality of durum they need at the best value.

### DURUM WHEAT PRODUCTION

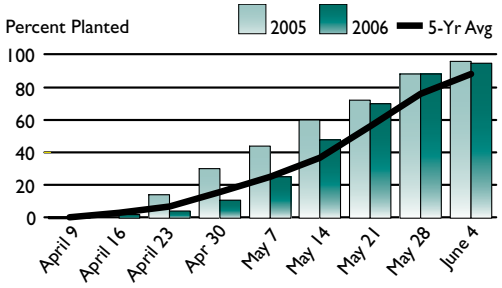
| | 2005 | 2006 | 2001-05 AVERAGE |
|---|---|---|---|
| **MILLION BUSHELS** | | | |
| Montana | 16.4 | 6.7 | 14.8 |
| North Dakota | 68.3 | 31.5 | 56.6 |
| Regional Total | 84.7 | 38.2 | 71.4 |
| U.S. Total | 101.0 | 53.5 | 91.9 |
| **MILLION METRIC TONS** | | | |
| Montana | 0.43 | 0.18 | 0.40 |
| North Dakota | 1.86 | 0.86 | 1.54 |
| Regional Total | 2.29 | 1.04 | 1.94 |
| U.S. Total | 2.72 | 1.46 | 2.50 |

Source: USDA September 2006 Small Grains Summary

## SEASONAL CONDITIONS

**PLANTING** began with slow progress due to cool, wet conditions in parts of the region. Improved conditions brought planting to the 50 percent mark mid-May, on pace with the five-year average and allowed planting to finish by the first week of June.

### DURUM PLANTING PROGRESS




**GROWING** conditions were ideal early in the season as warm temperatures and rain in June promoted quick emergence and boosted development. Crop condition ratings were excellent and strong yields looked promising as disease pressures were minimal in late June. A shift to much drier and hot conditions in July reversed the early promising look to the crop, especially in western parts of the primary durum region.

Dry, hot conditions prevailed up through harvest. Crop maturity was pushed ahead of normal and many areas under stress expanded. Limited disease and lack of rainfall allowed quality prospects to remain high during ripening.

**HARVEST** began in early August and progressed at about twice the normal pace. The advanced crop maturity, prevailing dry conditions and below average yields allowed for fast progression. Harvest was completed by the middle of September, two to three weeks ahead of normal.

### DURUM HARVEST PROGRESS

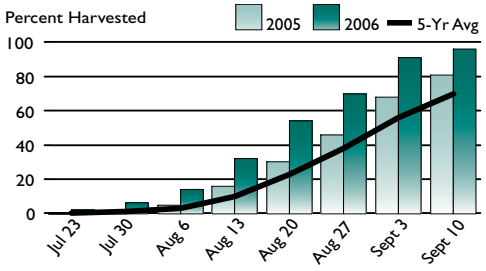



Photo credit: David Lipp, Fargo

# Wheat Characteristics

**WHEAT GRADES,** as defined by the Federal Grain Inspection Service (FGIS) of the USDA Grain Inspection, Packers and Stockyards Administration (GIPSA), reflect the general quality and condition of a representative sample. U.S. grades are based on test weight and include limits on damaged kernels, foreign material, shrunken and broken kernels, and wheat of contrasting classes. Each determination is made on the basis of the grain when free from dockage and shrunken and broken kernels.

## SUBCLASSES

Subclass is a separate marketing factor based on the weight percentage of kernels with a complete, hard and vitreous endosperm, the portion that makes semolina. For durum wheat the subclasses are:

- Hard Amber Durum (HAD)—at least 75 percent or more hard, vitreous kernels;
- Amber Durum (AD)— between 60 and 74 percent hard, vitreous kernels;
- Durum (D)—less than 60 percent hard, vitreous kernels.

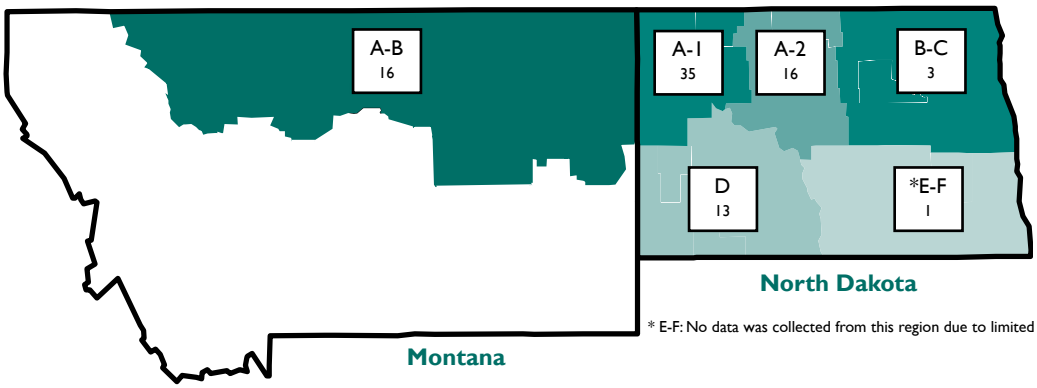
## OFFICIAL U.S. GRADES AND GRADE REQUIREMENTS (Revised June 1993)

| GRADING FACTORS | U.S. GRADES 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| **DURUM—MINIMUM TEST WEIGHTS** | | | | | |
| Pounds per bushel | 60.0 | 58.0 | 56.0 | 54.0 | 51.0 |
| Kilograms per hectoliter | 78.2 | 75.6 | 73.0 | 70.4 | 66.5 |
| **MAXIMUM PERCENT LIMITS OF:** | | | | | |
| 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/ 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 classes[2] | | | | | |
| 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 OF:** | | | | | |
| Other material | | | | | |
| Animal filth | 1 | 1 | 1 | 1 | 1 |
| Castor beans | 1 | 1 | 1 | 1 | 1 |
| Crotalaria seeds | 2 | 2 | 2 | 2 | 2 |
| Glass | 0 | 0 | 0 | 0 | 0 |
| Stones | 3 | 3 | 3 | 3 | 3 |
| Unknown foreign substances | 3 | 3 | 3 | 3 | 3 |
| Total[4] | 4 | 4 | 4 | 4 | 4 |
| Insect-damaged kernels in 100 grams | 31 | 31 | 31 | 31 | 31 |

U.S. Sample grade is wheat that:
(a) Does not meet the requirements for U.S. Nos. 1, 2, 3, 4, or 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.
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 percent 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.

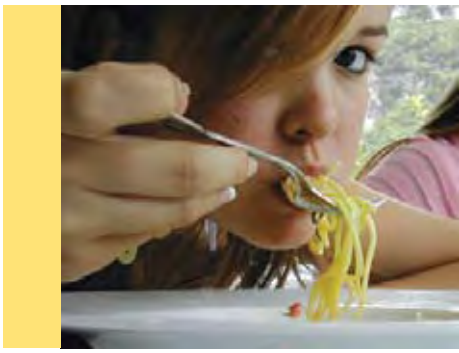
Wheat samples were obtained in Montana and North Dakota in the crop reporting areas identified in color. Samples were gathered during harvest from growers, farm bins and country elevators.

## CROP REPORTING AREAS & 2005 DURUM WHEAT PRODUCTION (million bushels)

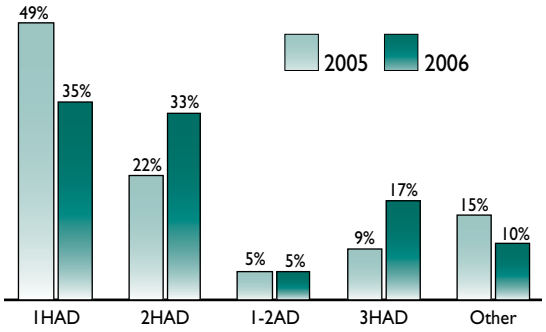



* E-F: No data was collected from this region due to limited production.

Source: National Agricultural Statistics Service
(2006 county estimates to be released in March)



### REGIONAL GRADE DISTRIBUTION

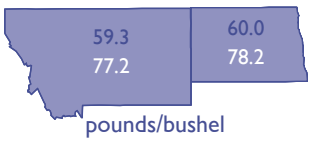



Sixty-eight percent of 2006 samples grade No. 2 HAD or better.

## OVERALL GRADE

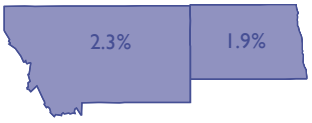
The average grade for the region is 2HAD. This grade represents average test weight of 59.9 pounds per bushel (78.0 kg/hl), total defects of 2.0 percent and vitreous kernel content of 90 percent.

### TEST WEIGHT BY STATE

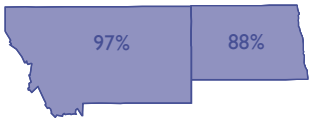



pounds/bushel
kilograms/hectoliter

### AVERAGE TOTAL DEFECTS BY STATE




### AVERAGE VITREOUS KERNELS BY STATE

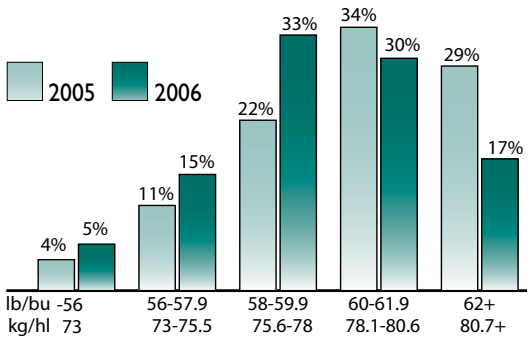



# Wheat Grading Data

| STATE AND CROP REPORTING AREA | TEST WEIGHT LBS/BU | TEST WEIGHT KG/HL | DAMAGE % | FOREIGN MATERIAL % | SHRUNKEN/ BROKEN KERNELS % | TOTAL DEFECTS % | CONTRASTING CLASSES % | U.S. GRADE | VITREOUS KERNELS % |
|---|---|---|---|---|---|---|---|---|---|
| **MONTANA (A-B)** | | | | | | | | | |
| State Avg. 2006 | 59.3 | 77.2 | 0.2 | 0.0 | 2.1 | 2.3 | 0.0 | 2HAD | 97 |
| State Avg. 2005 | 60.4 | 78.7 | 0.2 | 0.0 | 1.7 | 1.9 | 0.0 | 1HAD | 95 |
| **NORTH DAKOTA** | | | | | | | | | |
| Area A-1 | 60.1 | 78.3 | 0.2 | 0.1 | 1.5 | 1.8 | 0.0 | 1HAD | 91 |
| Area A-2 | 61.1 | 79.6 | 0.2 | 0.0 | 1.2 | 1.4 | 0.0 | 1HAD | 81 |
| Area B-C | 60.5 | 78.8 | 1.4 | 0.0 | 2.0 | 3.4 | 1.9 | 2HAD | 76 |
| Area D | 58.4 | 76.1 | 0.0 | 0.0 | 2.1 | 2.1 | 0.0 | 2HAD | 95 |
| State Avg. 2006 | 60.0 | 78.2 | 0.3 | 0.0 | 1.6 | 1.9 | 0.2 | 1HAD | 88 |
| State Avg. 2005 | 61.0 | 79.4 | 0.9 | 0.0 | 1.4 | 2.3 | 0.0 | 1HAD | 90 |
| **TWO-STATE REGION** | | | | | | | | | |
| Avg. 2006 | 59.9 | 78.0 | 0.2 | 0.0 | 1.7 | 2.0 | 0.1 | 2HAD | 90 |
| Avg. 2005 | 60.8 | 79.2 | 0.8 | 0.0 | 1.4 | 2.2 | 0.0 | 1HAD | 91 |
| Five-Year Avg. | 60.4 | 78.7 | 1.2 | 0.0 | 1.4 | 2.7 | 0.1 | 1HAD | 89 |

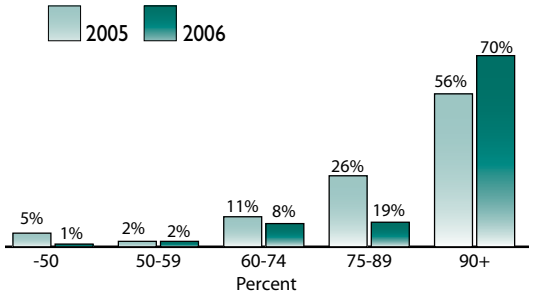
All state and regional averages have been adjusted to reflect production differences.

## REGIONAL TEST WEIGHT DISTRIBUTION



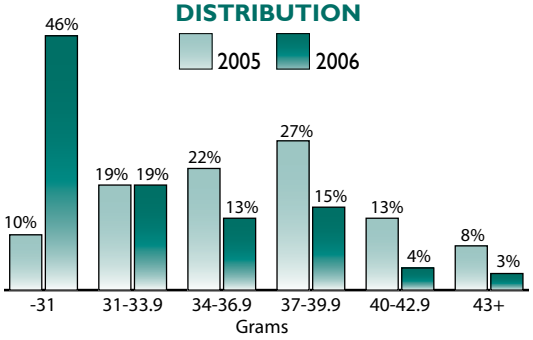

Forty-seven percent of 2006 samples have test weights of 60 lbs/bu (78.2 kg/hl) or greater. The regional average test weight is 59.9 lbs/bu (78.0 kg/hl), down from last year and the five-year average.

## REGIONAL VITREOUS KERNEL



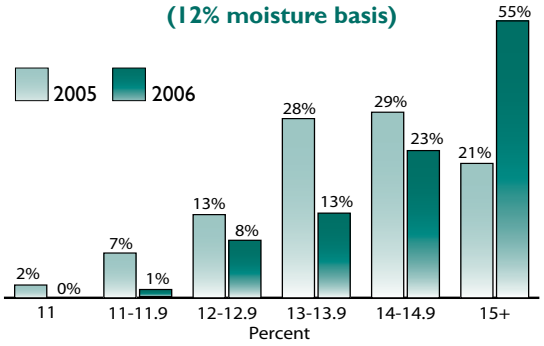

Eighty-nine percent of 2006 samples have 75 percent or greater vitreous kernels. The average percentage of vitreous kernels in the regional crop is 90 percent.

## REGIONAL THOUSAND KERNEL WEIGHT DISTRIBUTION



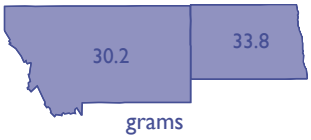

The 2006 crop exhibits lower average thousand kernel weight of 33.2 as compared to 35.5 last year.

## REGIONAL PROTEIN DISTRIBUTION (12% moisture basis)




Ninety-one percent of 2006 samples have a protein content of 13.0 percent or greater.

## THOUSAND KERNEL WEIGHT BY STATE




## AVERAGE PROTEIN BY STATE

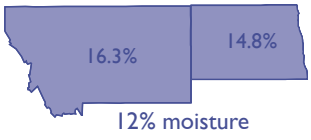
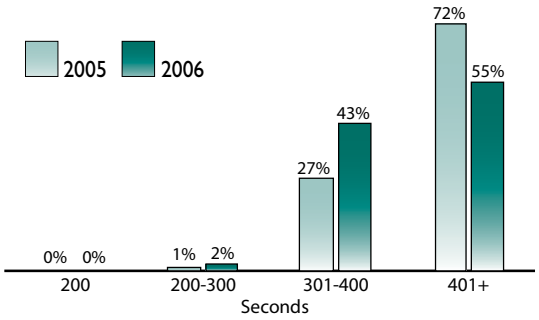


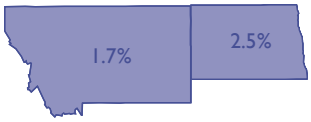
Photo credit: David Lipp, Fargo

### REGIONAL FALLING NUMBER

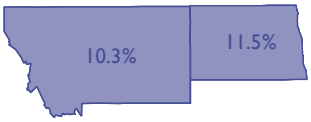



Nearly all samples of the 2006 crop have a falling number of 300 seconds or better.

### AVERAGE HARVEST DOCKAGE BY STATE



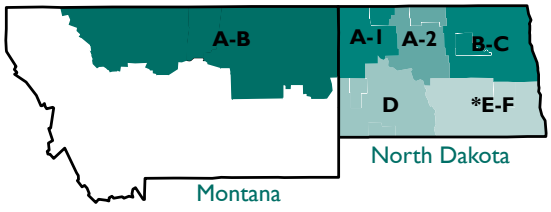

### AVERAGE MOISTURE BY STATE




## Other Kernel Quality Data

| STATE AND CROP REPORTING AREA | DOCKAGE % | MOISTURE % | 1000 KERNEL WEIGHT G | KERNEL DIST. MEDIUM % | KERNEL DIST. LARGE % | PROTEIN (DRY MATTER) % | PROTEIN (12% MOISTURE) % | WHEAT ASH % | FALLING NUMBER (SEC) | SEDIMENT-ATION (CC) |
|---|---|---|---|---|---|---|---|---|---|---|
| **MONTANA (A-B)** | | | | | | | | | | |
| State Avg. 2006 | 1.7 | 10.3 | 30.2 | 67 | 15 | 18.5 | 16.3 | 1.56 | 422 | 61 |
| State Avg. 2005 | 1.3 | 11.6 | 32.4 | 53 | 33 | 16.0 | 14.1 | 1.64 | 387 | 48 |
| **NORTH DAKOTA** | | | | | | | | | | |
| Area A-1 | 3.0 | 11.6 | 33.8 | 67 | 23 | 16.2 | 14.3 | 1.45 | 385 | 55 |
| Area A-2 | 1.5 | 11.6 | 35.0 | 60 | 35 | 16.7 | 14.7 | 1.52 | 359 | 51 |
| Area B-C | 1.1 | 12.1 | 37.7 | 51 | 44 | 16.1 | 14.2 | 1.63 | 378 | 49 |
| Area D | 2.8 | 10.7 | 30.8 | 70 | 15 | 18.7 | 16.5 | 1.66 | 380 | 57 |
| State Avg. 2006 | 2.5 | 11.5 | 33.8 | 65 | 26 | 16.8 | 14.8 | 1.52 | 377 | 54 |
| State Avg. 2005 | 1.5 | 12.7 | 36.2 | 37 | 54 | 15.0 | 13.2 | 1.68 | 376 | 44 |
| **TWO-STATE REGION** | | | | | | | | | | |
| Avg. 2006 | 2.3 | 11.3 | 33.2 | 65 | 24 | 17.1 | 15.1 | 1.53 | 385 | 55 |
| Avg. 2005 | 1.5 | 12.5 | 35.5 | 40 | 51 | 15.2 | 13.4 | 1.67 | 378 | 45 |
| 5-Year Avg. | 1.3 | 11.7 | 36.6 | 42 | 51 | 15.8 | 13.9 | 1.62 | 354 | 47 |

All state and regional averages have been adjusted to reflect production differences.




* E-F: No data was collected from this region due to limited production.

# Milling Characteristics

Total extraction represents the portion of the kernel that can be milled into flour and semolina. **SEMOLINA** extraction is the portion milled into semolina only.

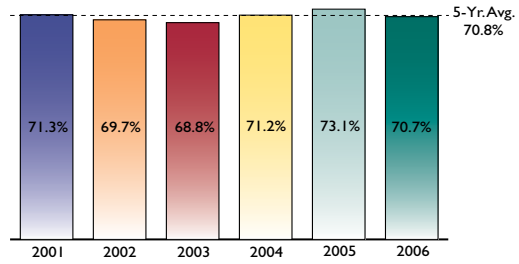
**ASH CONTENT** in the endosperm of durum is inherently higher than in the endosperm of other hard wheats, but can still be used as a relative measure of bran or mineral content in the flour and semolina.

**SPECKS** appear in semolina when small particles of bran or other material escape the cleaning and purifying process. Millers can control speck count by selecting durum that is free of disease and foreign material, thoroughly cleaning the durum, properly tempering and conditioning the wheat before milling, and by using purifiers to remove small bran particles from the semolina.

**PROTEIN CONTENT** in semolina has a high correlation with gluten content and, in turn, mechanical strength and cooking quality. Wet gluten is a quantitative measure of the gluten forming proteins in semolina that are primarily responsible for its mechanical strength and pasta quality.

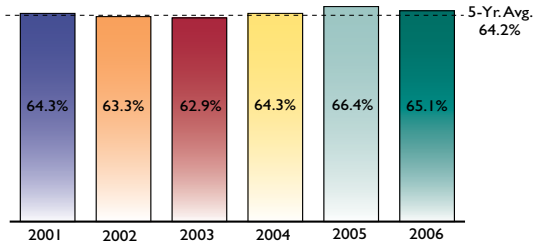
**MIXOGRAM** curves reveal important information about the gluten quality of semolina and ultimately about the potential cooked firmness of pasta. Mixograms are rated on a scale of 1 to 8, with the higher values indicating strong mixing characteristics.

### REGIONAL AVERAGE: TOTAL EXTRACTION



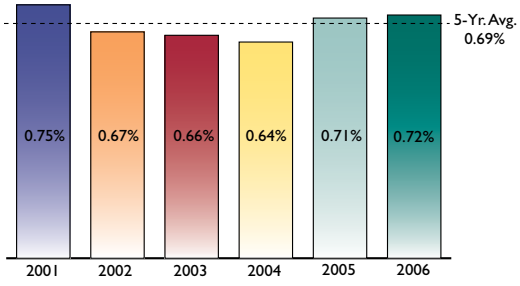

The regional average is 70.7 percent, down from last year's 73.1 percent but near the five-year average of 70.8 percent.

### REGIONAL AVERAGE: SEMOLINA EXTRACTION



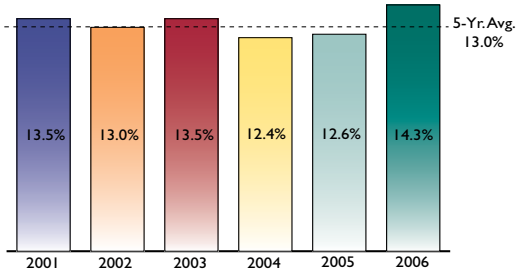

The regional average is 65.1 percent, down from last year's 66.4 percent but up from the five year average of 64.2 percent.

### REGIONAL AVERAGE: ASH CONTENT



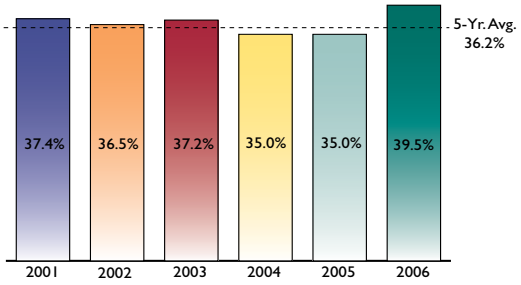

The 2006 crop produced semolina with an average ash content of 0.72 percent, slightly higher than last year and the five-year average.

### REGIONAL AVERAGE: SEMOLINA PROTEIN CONTENT



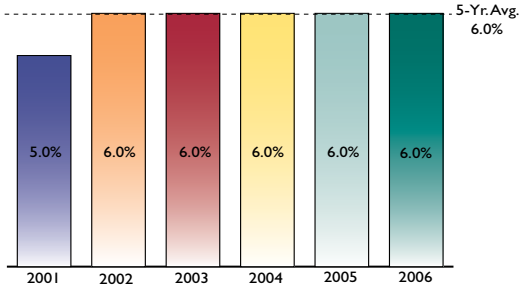

The 2006 crop produced semolina with an average protein content of 14.3 percent, higher than last year and the five-year average.

## REGIONAL AVERAGE: WET GLUTEN



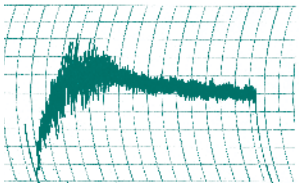

Average wet gluten content for the 2006 crop is 39.5 percent, higher than last year and the five-year average.

## REGIONAL AVERAGE: MIXOGRAM CLASSIFICATION




The regional average mixogram score is 6.0 (on a scale of 1 to 8), the same as last year and the five-year average.

## REGIONAL AVERAGE MIXOGRAM



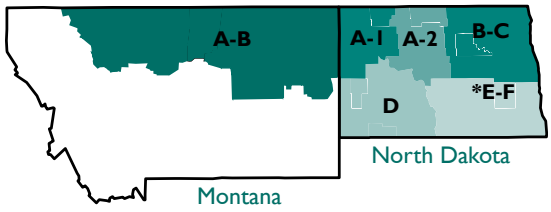
**A 6.0 mixogram classification on a scale of 1 to 8 indicates strength.**

# Semolina Quality Data

| STATE AND CROP REPORTING AREA | TOTAL EXTRACTION % | SEMOLINA EXTRACTION % | ASH % | SPECKS NO/10 SQ IN | PROTEIN % | WET GLUTEN % | GLUTEN INDEX % | MIXOGRAM[1] CLASSIFICATION SCALE 1-8 |
|---|---|---|---|---|---|---|---|---|
| **MONTANA (A-B)** | | | | | | | | |
| State Avg. 2006 | 70.4 | 65.1 | 0.79 | 17 | 15.6 | 43.1 | 56.6 | 6 |
| State Avg. 2005 | 71.7 | 66.0 | 0.74 | 17 | 13.3 | 37.6 | 43.1 | 6 |
| **NORTH DAKOTA** | | | | | | | | |
| Area A-1 | 70.6 | 65.1 | 0.68 | 20 | 13.6 | 37.7 | 53.1 | 6 |
| Area A-2 | 71.6 | 65.7 | 0.69 | 17 | 14.0 | 39.0 | 57.4 | 5 |
| Area B-C | 71.2 | 65.4 | 0.73 | 30 | 13.3 | 36.6 | 57.7 | 6 |
| Area D | 69.9 | 64.5 | 0.76 | 27 | 15.6 | 41.9 | 64.6 | 6 |
| State Avg. 2006 | 70.7 | 65.2 | 0.70 | 21 | 14.0 | 38.7 | 56.7 | 6 |
| State Avg. 2005 | 73.4 | 66.4 | 0.71 | 20 | 12.4 | 34.4 | 45.4 | 5 |
| **TWO-STATE REGION** | | | | | | | | |
| Average 2006 | 70.7 | 65.1 | 0.72 | 21 | 14.3 | 39.5 | 56.7 | 6 |
| Average 2005 | 73.1 | 66.4 | 0.71 | 19 | 12.6 | 35.0 | 45.0 | 6 |
| 5-Year Average | 70.8 | 64.2 | 0.69 | 22 | 13.0 | 36.2 | 39.3 | 6 |

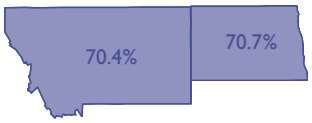
Note: All state and regional averages have been adjusted to reflect production differences.

[1]See reference mixograms for durum wheat on page 15.

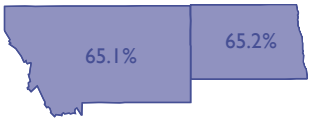



* E-F: No data was collected from this region due to limited production.

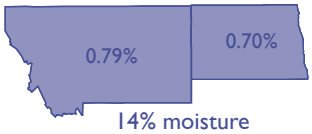
## AVERAGE TOTAL EXTRACTION BY STATE




## AVERAGE SEMOLINA EXTRACTION BY STATE

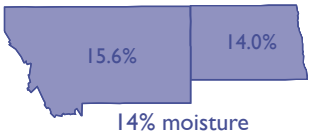



## AVERAGE ASH CONTENT BY STATE



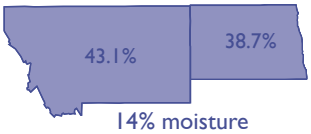

14% moisture

## AVERAGE SEMOLINA PROTEIN CONTENT BY STATE




14% moisture

## AVERAGE WET GLUTEN BY STATE




14% moisture

Photo credits: Wheat Foods Council

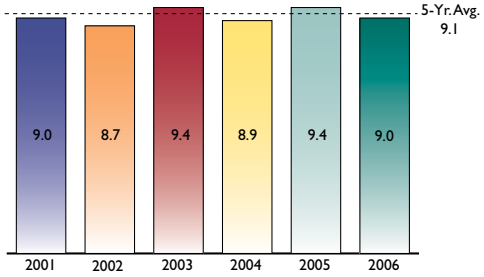
# Pasta Characteristics

**DRY PASTA PROCESSORS** want a finished product that is visually appealing, elastic and strong enough to resist breakage during cutting, packaging, handling and shipping, able to withstand the rigors of cooking, and satisfying to the consumer palate.

**YELLOW COLOR** in semolina and pasta is a traditional, rather than functional, mark of quality. In the early days of the pasta industry, before sophisticated testing evolved, consumers assumed that a yellow pasta was made from durum wheat, which is known to make pasta with superior cooking quality compared to that made from other hard wheats.

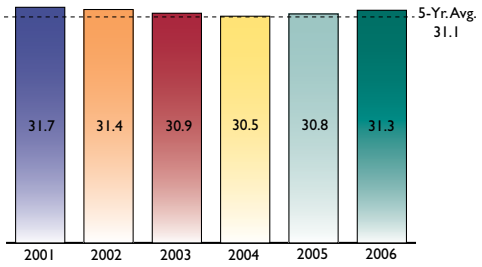
Most consumers prefer pasta that is **"AL DENTE,"** meaning it has some firmness to the bite. Good quality pasta that is cooked according to package directions should not be sticky or mushy when eaten.

### REGIONAL AVERAGE: COLOR SCORE



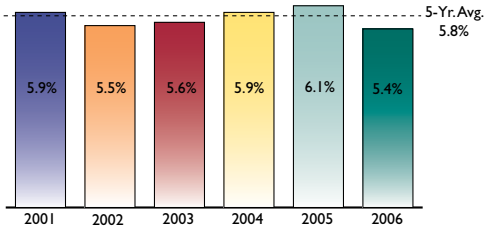

The regional average color score is 9.0, lower than 2005, but near the five-year average. Pasta samples with scores of 8.0 or higher have good color.

### REGIONAL AVERAGE: COOKED WEIGHT (grams)



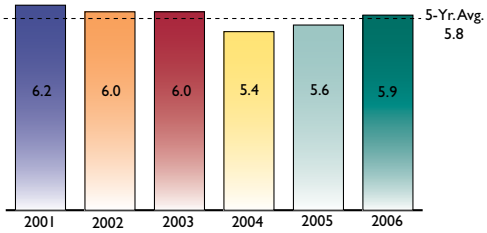

The regional average cooked weight is 31.3 grams, above last year and the five-year average.

### REGIONAL AVERAGE: COOKING LOSS




The regional average cooking loss is 5.4 percent, lower than last year and the five-year average.

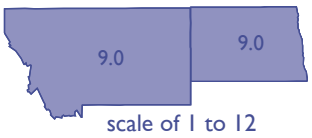
### REGIONAL AVERAGE: COOKED FIRMNESS (g cm)




The regional average cooked firmness is 5.9 g cm, higher than last year and the five-year average.

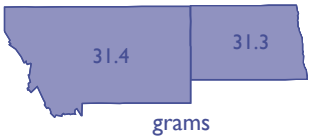
Photo credit: North Dakota Mill

### AVERAGE COLOR SCORE BY STATE



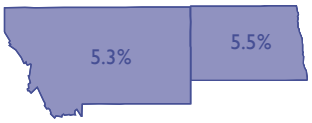

scale of 1 to 12

### AVERAGE COOKED WEIGHT BY STATE

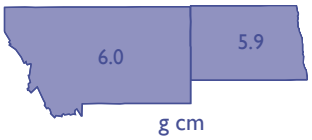



grams

### AVERAGE COOKING LOSS BY STATE




### AVERAGE COOKED FIRMNESS BY STATE

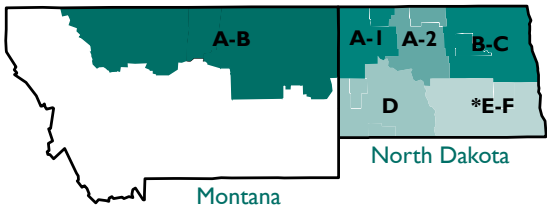



g cm

# Spaghetti Processing Properties

| STATE AND CROP REPORTING AREA | COLOR SCORE (1-12) | COOKED WEIGHT G | COOKING LOSS % | COOKED FIRMNESS G CM |
|---|---|---|---|---|
| **MONTANA (A-B)** | | | | |
| State Avg. 2006 | 9.0 | 31.4 | 5.3 | 6.0 |
| State Avg. 2005 | 9.5 | 30.4 | 6.2 | 6.1 |
| **NORTH DAKOTA** | | | | |
| Area A-1 | 9.0 | 31.7 | 5.4 | 5.8 |
| Area A-2 | 9.5 | 31.4 | 5.5 | 5.7 |
| Area B-C | 9.0 | 31.2 | 5.9 | 5.3 |
| Area D | 8.5 | 30.2 | 5.5 | 6.7 |
| State Avg. 2006 | 9.0 | 31.3 | 5.5 | 5.9 |
| State Avg. 2005 | 9.4 | 30.9 | 6.1 | 5.5 |
| **TWO-STATE REGION** | | | | |
| Avg. 2006 | 9.0 | 31.3 | 5.4 | 5.9 |
| Avg. 2005 | 9.4 | 30.8 | 6.1 | 5.6 |
| Five-Year Avg. | 9.1 | 31.1 | 5.8 | 5.8 |

Note: All state and regional averages have been adjusted to reflect production differences.




* E-F: No data was collected from this region due to limited production.



Photo: Wheat Foods Council

# Summary Information

Photo credit: David Lipp, Fargo

## Average Quality Factors for the Great Plains Durum Wheat Crop 2001-2006

| | 2001 | 2002 | 2003 | 2004 | 2005 | FIVE-YEAR AVERAGE | 2006 |
|---|---|---|---|---|---|---|---|
| **GRADING DATA** | | | | | | | |
| Test Weight (lbs/bu) | 58.8 | 59.9 | 61.0 | 61.7 | 60.8 | 60.4 | 59.9 |
| (kg/hl) | 76.6 | 78.0 | 79.4 | 80.3 | 79.2 | 78.7 | 78.0 |
| Total Defects (%) | 5.0 | 3.3 | 1.6 | 1.2 | 2.2 | 2.7 | 2.0 |
| Vitreous Kernels (%) | 88 | 85 | 92 | 89 | 91 | 89 | 90 |
| Grade | 2HAD | 2HAD | 1HAD | 1HAD | 1HAD | 1HAD | 2HAD |
| **OTHER WHEAT DATA** | | | | | | | |
| Dockage (%) | 1.5 | 1.7 | 0.7 | 1.2 | 1.5 | 1.3 | 2.3 |
| Protein: 12% Moisture (%) | 14.4 | 14.0 | 14.5 | 13.4 | 13.4 | 13.9 | 15.1 |
| 1000 Kernel Weight (gm) | 36.7 | 36.9 | 33.8 | 40.2 | 35.5 | 36.6 | 33.2 |
| Ash (%) | 1.82 | 1.56 | 1.53 | 1.50 | 1.67 | 1.62 | 1.53 |
| Falling Number (sec) | 355 | 292 | 391 | 356 | 378 | 354 | 385 |
| Sedimentation (mm) | 42 | 46 | 51 | 49 | 45 | 47 | 55 |
| **SEMOLINA DATA** | | | | | | | |
| Total Extraction (%) | 71.3 | 69.7 | 68.8 | 71.2 | 73.1 | 70.8 | 70.7 |
| Semolina Extraction (%) | 64.3 | 63.3 | 62.9 | 64.3 | 66.4 | 64.2 | 65.1 |
| Ash (%) | 0.75 | 0.67 | 0.66 | 0.64 | 0.71 | 0.69 | 0.72 |
| Specks (no/10 sq in) | 32 | 26 | 12 | 20 | 19 | 22 | 21 |
| Protein (%) | 13.5 | 13.0 | 13.5 | 12.4 | 12.6 | 13.0 | 14.3 |
| Wet Gluten (%) | 37.4 | 36.5 | 37.2 | 35.0 | 35.0 | 36.2 | 39.5 |
| Gluten Index (%) | 28.1 | 36.8 | 42.7 | 43.7 | 45.4 | 39.3 | 56.7 |
| Mixograph Classification | 5 | 6 | 6 | 6 | 6 | 6 | 6 |
| **SPAGHETTI PROCESSING DATA** | | | | | | | |
| Color Score (scale of 1-12) | 9.0 | 8.7 | 9.4 | 8.9 | 9.4 | 9.1 | 9.0 |
| Cooked Weight (gm) | 31.7 | 31.4 | 30.9 | 30.5 | 30.8 | 31.1 | 31.3 |
| Cooking Loss (%) | 5.9 | 5.5 | 5.6 | 5.9 | 6.1 | 5.8 | 5.4 |
| Cooked Firmness (g cm) | 6.2 | 6.0 | 6.0 | 5.4 | 5.6 | 5.8 | 5.9 |

# Export Cargo Sampling

Photo credit: USDA Agricultural Research

## Export Cargo Data

| | 2004 | 2005 |
|---|---|---|
| SAMPLE COUNT | 29 | 27 |
| **GRADING DATA** | | |
| Test Weight (lbs/bu) | 61.0 | 61.4 |
| Test Weight (kg/hl) | 79.4 | 80.0 |
| Damaged Kernels (%) | 2.4 | 2.1 |
| Foreign Material (%) | 0.2 | 0.2 |
| Shrunken & Broken (%) | 1.2 | 1.3 |
| Total Defects (%) | 3.9 | 3.6 |
| Vitreous Kernels (%) | 81 | 85 |
| Grade | 2HAD | 2HAD |
| **OTHER WHEAT DATA** | | |
| Dockage (%) | 0.5 | 0.5 |
| Moisture (%) | 12.7 | 12.6 |
| Protein: 12% Moisture (%) | 13.3 | 13.2 |
| Protein: Dry (%) | 15.1 | 15.0 |
| Ash: 14% Moisture (%) | 1.53 | 1.59 |
| Ash: Dry (%) | 1.78 | 1.85 |
| 1000 Kernel Weight (g) | 38.3 | 36.7 |
| Kernel Size (%) lg/md/sm | 57/36/6 | 55/37/7 |
| Falling Number (sec) | 349 | 380 |
| **SEMOLINA DATA** | | |
| Total Extraction (%) | 72.0 | 72.2 |
| Semolina Extraction (%) | 64.8 | 64.9 |
| Ash: 14% Moisture (%) | 0.65 | 0.68 |
| Ash: Dry (%) | 0.76 | 0.79 |
| Specks (no/10 sq in) | 23.6 | 24.9 |
| Protein: 14% Moisture (%) | 12.4 | 12.3 |
| Protein: Dry (%) | 14.4 | 14.3 |
| Gluten Index (%) | 40.8 | 42.5 |
| Mixograph Classification (scale of 1-8) | 5.8 | 5.3 |
| Color: L (white-black) | 84.5 | 84.6 |
| a (red-green) | -2.5 | -2.6 |
| b (yellow-blue) | 23.6 | 24.9 |
| **SPAGHETTI PROCESSING DATA** | | |
| Color Score (scale of 1-12) | 8.3 | 8.7 |
| Cooked Weight (gm) | 31.0 | 32.0 |
| Cooking Loss (%) | 6.1 | 5.9 |
| Cooked Firmness (g cm) | 5.2 | 4.9 |

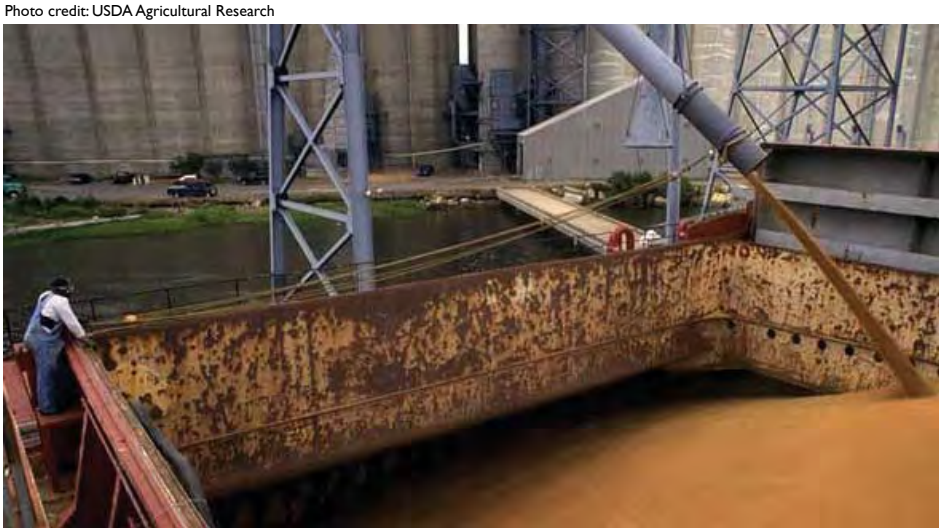
Data contained in previous sections of this report are derived from the testing of samples gathered during harvest from origination points throughout the northern U.S. durum growing region. The results provide an assessment of the overall quality of the crop produced in a given year.

U.S. Wheat Associates, the export market development arm for American wheat growers, furthers this information by commissioning an export cargo sampling program. The program provides an accurate representation of the supplies moving through the grain marketing and transportation system and actually reaching export points. Results show the quality levels at which U.S. wheat is realistically traded and are useful to customers in developing reasonable purchase specifications.

The Federal Grain Inspection Service oversees the program whereby all export inspection agencies at all ports collect every tenth sublot sample from every vessel of U.S. wheat shipped during three two-month time periods annually.

The durum wheat samples are sent for analysis to the Durum Wheat Quality and Pasta Processing Laboratory in the North Dakota State University Plant Science Department.

Photo credit: USDA Agricultural Research



# Laboratory Analysis

Photo credit:
USDA Agricultural Research Service

All quality data contained in this report is the result of testing and analysis conducted by or under the supervision of Dr. Frank A. Manthey, associate professor, and Brent L. Hinsz, food technologist, of the Durum Wheat Quality and Pasta Processing Laboratory in the Department of Plant Science at North Dakota State University, Fargo, USA.

**COLLECTION** · The North Dakota and Montana state offices of the National Agricultural Statistics Service obtained durum wheat samples during harvest directly from growers, farm bins and local elevators. These samples reflect the condition of the grain at the point of origin. Collection began the first week of August when approximately 5 percent of North Dakota's durum crop had been harvested and continued until mid-September when harvest was mostly complete. A total of 219 samples were collected during harvest from Montana (44) and North Dakota (175).

**ANALYSIS** · Half of the total wheat samples collected were analyzed for grade and other physical kernel characteristics. The data obtained from the analyses were used to generate frequency distributions as a percentage of the harvested crop. Distribution results may differ from data presented in the various tables, because the latter are derived from production adjusted averages, rather than simple averages.

All samples received in the laboratory were sub-sampled to obtain one composite sample for each of the five areas in North Dakota and one composite for Montana. These were analyzed for grade and physical characteristics as well as milling performance and spaghetti processing qualities. Again, all state and regional averages have been adjusted to reflect production as opposed to simple averaging.

Photo credit: North Dakota State University

# Methods, Terms & Symbols

## Wheat

**Sample Collection** • Each sample contained approximately 2 to 3 pounds of wheat, stored in securely closed, moisture proof plastic bags.

**Moisture** • Official USDA procedure using Motomco Moisture Meter.

**Grade** • Official United States Standards for Grain, as determined by a licensed grain inspector. North Dakota Grain Inspection Service, Fargo, ND, provided grades for composite wheat samples representing each crop reporting area.

**Vitreous Kernels** • Approximate percentage of kernels having vitreous endosperm, based on weights.

**Dockage** • Official USDA procedure. All matter other than wheat which can be removed readily from a test portion of the original sample by use of an approved device (Carter Dockage Tester). Dockage may also include underdeveloped, shriveled and small pieces of wheat kernels removed in properly separating the material other than wheat and which cannot be recovered by properly rescreening or recleaning.

**Test Weight** • American Association of Cereal Chemists Method 55-10 approved April 1961, revised October 1999. Measured as pounds per bushel (lb/bu), Kilograms per hectoliter (Kg/h) = (lbs/bu X 1.292) + 0.630. Approved Methods of the American Association of Cereal Chemists, Cereal Laboratory Methods (10th Edition), St. Paul, MN (2000).

**Thousand Kernel Weight** • Based on 10 gram sample of cleaned wheat (free of foreign material and broken kernels) counted by electronic seed counter.

**Kernel Size Distribution** • Determinations made according to the procedure described in Cereal Science Today 5:(3), 71 (1960). Kernels remaining over a Tyler No. 7 (2.92 mm opening) are classified as "large;" kernels passing through the top sieve but remaining on a Tyler No. 9 (2.24 mm opening) are classified as "medium" size kernels. Kernel passing through the second sieve are classed as "small." Size is reported as percentage of large, medium, and small kernels.

**Protein** • American Association of Cereal Chemists (AAC) Method: 46-30 (Combustion Method), expressed on dry basis and 12 percent moisture basis.

**Ash** • American Association of Cereal Chemists Method 08-01, approved April 1961, revised October 1999; expressed on a 14 percent moisture basis.

Photo credit: North Dakota Mill

**FALLING NUMBER** • American Association of Cereal Chemists Method 56-81B, approved November 1972, revised September 1999; units of seconds (14 percent moisture basis).

**MICRO SEDIMENTATION** • Determined as described by Dick, J.W. and Quick, J.S. Cereal Chem. 60(4):315-318, 1983.

**WET GLUTEN** • American Association of Cereal Chemists Method 38-12, approved October 1999; expressed on a 14 percent moisture basis determined with the glutomatic instrument.

**GLUTEN INDEX** • American Association of Cereal Chemists Method 38-12, approved October 1999; determined with the glutomatic instrument as an indication of gluten strength.

## SEMOLINA

**EXTRACTION** • AACC Method 26-41 (modified for the Buhler Mill). Expressed on a total product basis.

**ASH** • AACC Method 08-01, approved April 1961, revised October 1999; expressed on a 14 percent moisture basis.

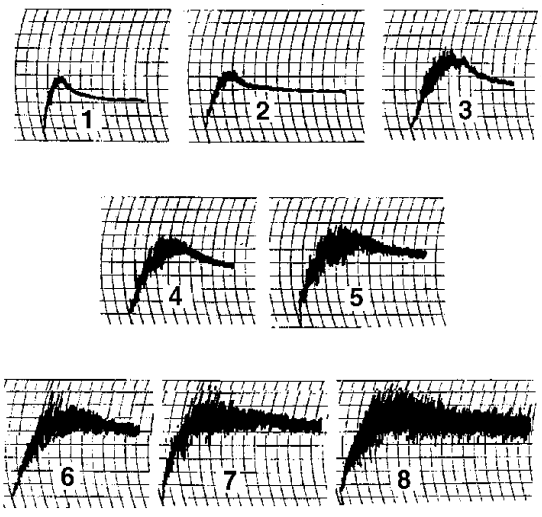
**PROTEIN** • AACC Method 46-30 (combustion method), approved September 1995, revised October 1999, N x 5.7, expressed on a 14 percent moisture basis.

Photo credit: USDA Agricultural Research Service

**SPECKS** • The number of specks in semolina was determined on a flat surface under a constant light source, and counting the visible specks (brown and black particles) in three different one-inch square areas. The average of the three readings was converted to the number of specks per 10 square inches.

**MIXOGRAPH** • Mixograph evaluation of semolina was performed according to the AACC Method 54-40A with some modifications: Ten grams of semolina (weighed on 14 percent moisture basis) were mixed for 8 min at constant water absorption of 5.8 ml, using a spring setting of 8. The mixograms were scored by comparing them to reference mixograms. A scale of 1 to 8 is employed, higher values indicate strong mixing characteristics (see reference mixogram chart).

### REFERENCE MIXOGRAMS FOR DURUM WHEAT



## SPAGHETTI

**PROCESSING** • Pasta was made using the laboratory procedure described by Walsh, Ebeling, and Dick, *Cereal Sci. Today*: 16(11) 385, 1971. A 1-Kg semolina was mixed with the appropriate amount of water that gave a dough consistency of 32 percent total water absorption. The other processing conditions used were: Water temperature, 40 C, extruder shaft speed, 25 rpm and vacuum, 18 in. Hg; the dough was pressed through an 84-strand teflon-coated spaghetti die with 0.157 cm openings. The extruded spaghetti samples were dried at high temperature for 12 hrs, using maximum temperature and relative humidity of 73 C and 83 percent respectively.

**COLOR** • Color scores were determined by light reflectance (AACC Method 14-22, 1983), using a Minolta Color Difference Meter (Model CR 310, Minolta Camera Co., Japan). The scores were generated according to the new color map designed by Debbouz (Pasta J. vol 6, No 6, 1994). A spaghetti sample with a score of 8.0 or higher is considered to have good color.

Photo credits: Wheat Foods Council

**COOKED WEIGHT** • AACC Method 66-50 with some modifications: 10 g of dry spaghetti were placed in 300 ml boiling distilled water and cooked for 12 min. The cooked and drained spaghetti sample was weighed and the results were reported in grams.

**COOKING LOSS** • AACC Method 66-50. Solids lost to the cooking water. After drying the residue was weighed and reported as percentage of the original dry sample.

**FIRMNESS** • AACC Method 66-50 with a plexiglass tooth attached to a Texture Analyzer (Model TA-XT2, Texture Technology Corp., Scarsdale, New York).

Photo credit: USDA Agricultural Research Service

# Varietal Information

Quality products begin with quality ingredients. In the case of wheat, quality begins with the varieties planted. Within the durum class of wheat, there are different varieties available—all with relatively uniform characteristics. A public plant breeder at North Dakota State University in Fargo develops and releases most of the durum varieties grown in the northern region, although some private firms also have durum breeding programs. Before any durum variety is released to the public, it must meet or exceed current standards for the class. Prospective releases are evaluated for milling and pasta characteristics as well as for yield, protein content, test weight, resistance to diseases and insects, and straw strength.

## Popular and New Durum Wheat Varieties

| | | | AGRONOMIC DESCRIPTION | | REACTION TO DISEASE[2] | | 2005 AVERAGE YIELD | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | AGENT[1] | | | | | | EASTERN[3] | | WESTERN[4] | | OVERALL[5] |
| VARIETY | OR ORIGIN | YEAR RELEASED | STRAW STRENGTH | MATURITY | FOLIAR DISEASE | HEAD (SCAB) | N.D. BU/ACRE | N.D. MT/HA | N.D. BU/ACRE | N.D. MT/HA | QUALITY RATING |
| Alkabo | ND | 2005 | v.strg | med. | M | MS | 52.4 | 3.52 | 52.1 | 3.50 | good |
| Ben | ND | 1996 | strg. | med. | MR | S* | 48.9 | 3.28 | 51.7 | 3.47 | good |
| Dilse | ND | 2002 | strg. | late | M | MS | n/a | n/a | 50.6 | 3.40 | excellent |
| Divide | ND | 2005 | strg. | med. | M | MR | 59.1 | 3.97 | 54.7 | 3.67 | excellent |
| Grenora | ND | 2005 | strg. | med. | M | MS | 56.5 | 3.79 | 56.8 | 3.81 | good |
| Lebsock | ND | 1999 | strg. | med. | M | MS | 56.9 | 3.82 | 53.0 | 3.56 | good |
| Maier | ND | 1998 | strg. | m-late | M | S* | 49.3 | 3.31 | 54.0 | 3.63 | excellent |
| Mountrail | ND | 1998 | strg. | late | M | S* | 53.9 | 3.62 | 53.2 | 3.57 | average |
| Munich | ND | 1995 | v.strg. | med. | MR | S* | n/a | n/a | 49.3 | 3.31 | good |
| Pierce | ND | 2001 | m.strg. | med. | MS | S | 54.0 | 3.63 | 55.0 | 3.67 | excellent |

Source: 2005 North Dakota Durum Wheat Variety Performance Descriptions

1 ND-North Dakota State University

2 Reaction to Disease: resistant (R), moderately resistant (MR), intermediate (M), moderately susceptible (MS), susceptible (S), very susceptible (VS). *Indicates yield and/or quality have often been higher than would be expected based on visual head blight symptoms alone.

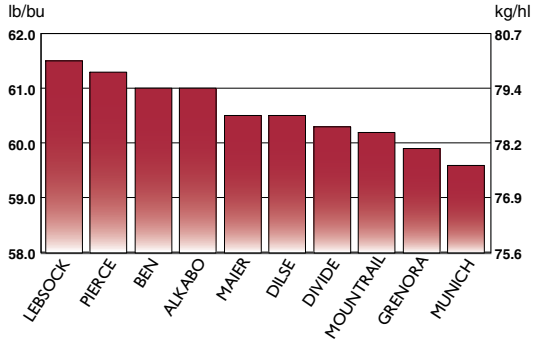
3 2005 data from Carrington and Langdon locations in North Dakota.

4 2005 data from Minot, Williston, Dickinson and Hettinger locations in North Dakota.

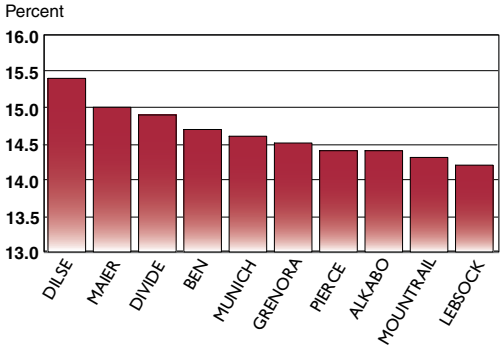
5 Based on kernel attributes, milling and semolina processing, pasta color, and spaghetti cooking performance.

Photo credit: David Lipp, Fargo, N.D.

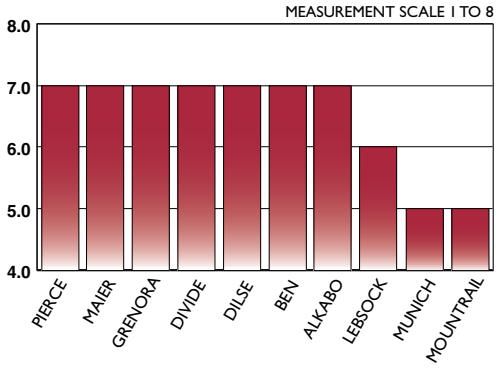
## TEST WEIGHT COMPARISON



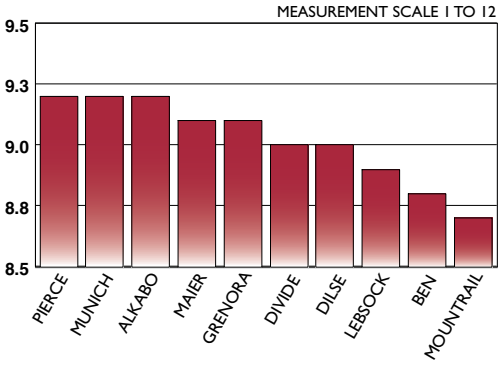

## WHEAT PROTEIN CONTENT COMPARISON (12% MOISTURE CONTENT)



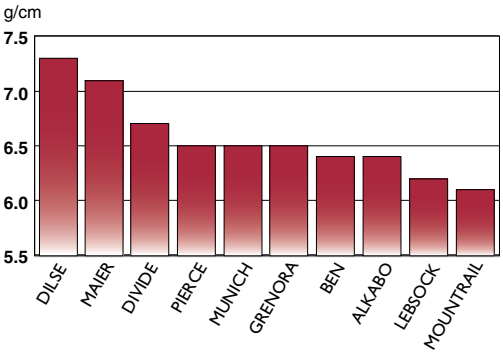

## MIXOGRAPH COMPARISON



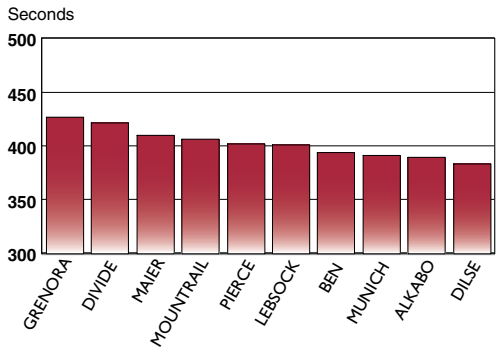

## PASTA COLOR COMPARISON




## COOKED FIRMNESS COMPARISON




## WHEAT FALLING NUMBER COMPARISON




**Traditionally, northern grown durum is known for its high protein content, good "yellow" color and high semolina extraction.**

**Environment influences the quailty of varieties across growing areas and planting years. For this reason, wheat breeders use "check" or reference varieties to evaluate quality in experimental varieties. They usually test and analyze quality data from multiple years and growing locations before a variety is released.**

**Breeders are working towards future varieties that have enhanced color and gluten strength, all important quality factors for end-users.**

Note: This data is based on testing from multiple North Dakota growing locations during the 2001-2005 seasons.

## NORTH DAKOTA

Leading durum varieties planted in North Dakota in 2006 are Lebsock, Mountrail and Ben. Together the top three varieties account for 70 percent of planted acres in 2006. Three other varieties that showed growth in 2006 and promise to see further expansion in coming years are Pierce, Maier and Dilse. These are among the highlights of a June survey conducted by USDA's North Dakota Agricultural Statistics Service.

**LEBSOCK** remained the top durum variety in North Dakota for the third straight year with 30 percent of acres. It also accounts for 10 percent of the acres in Montana. Lebsock enjoys broad appeal across North Dakota. It has good disease tolerance, is one of the highest yielding varieties statewide and has good end-use quality.

**BEN** declined in acreage in North Dakota for the fourth straight year, but remains third with 13 percent of acres. It is primarily produced in southwest North Dakota. Ben has good end-use quality and the highest tolerance to foliar diseases.

**PIERCE, MAIER & DILSE** combined account for 17 percent of the acres in 2006, up slightly from 12 percent in 2005. These varieties have excellent pasta quality.

### DURUM WHEAT VARIETIES PLANTED ACRES IN NORTH DAKOTA

| VARIETY | 2005 %[1] | 2006 %[1] | 2006 ACRES (1,000) |
|---|---|---|---|
| Lebsock | 28.3 | 29.7 | 386.1 |
| Mountrail | 25.5 | 27.3 | 354.3 |
| Ben | 16.4 | 13.4 | 174.5 |
| Pierce | 6.4 | 8.4 | 109.4 |
| Maier | 2.6 | 4.3 | 56.0 |
| Dilse | 2.5 | 4.0 | 52.3 |
| Kyle | 4.0 | 3.0 | 38.9 |
| Munich | 1.9 | 2.6 | 34.0 |
| Primo Doro | 0.1 | 1.5 | 19.4 |
| Renville | 3.0 | 0.8 | 10.7 |
| Monroe | 1.1 | 0.7 | 8.6 |
| Medora | 0.0 | 0.5 | 6.7 |
| Vic | 1.2 | 0.4 | 5.5 |
| Grande Doro | 0.6 | 0.2 | 2.5 |
| Other[2] | 6.4 | 3.2 | 41.1 |
| All Varieties | 100.0 | 100.0 | 1300.0[3] |

1/ Percentages may not add to 100 due to rounding.
2/ Other includes other varieties not listed and unknown varieties.
3/ Based on June 2006 survey. September 29, 2006 estimate remains 1.3 million acres.

### NORTH DAKOTA AGRICULTURAL STATISTICS DISTRICTS 2006 PLANTED AREA (1,000 ACRES)

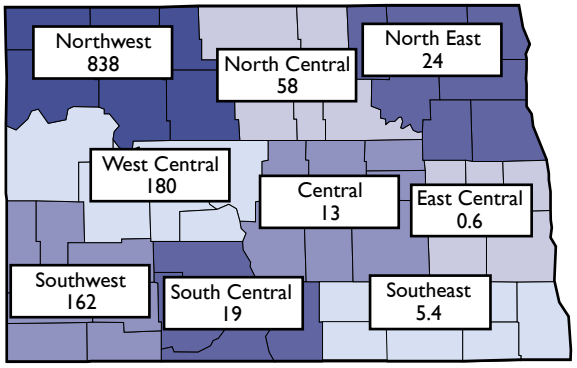


Photo credit: David Lipp, Fargo, N.D.

## DURUM WHEAT VARIETIES IN NORTH DAKOTA SHARE OF 2006 PLANTINGS BY CROP DISTRICT

| VARIETY | NORTH WEST | NORTH CENTRAL | NORTH EAST | WEST CENTRAL | CENTRAL | EAST CENTRAL | SOUTH WEST | SOUTH CENTRAL | SOUTH EAST | TOTAL STATE |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | PERCENTAGE (%)[1] | | | | | |
| Lebsock | 29.8 | 34.1 | 83.8 | 31.2 | 65.4 | 0.0 | 13.2 | 55.8 | 0.0 | 29.7 |
| Mountrail | 38.2 | 0.0 | 0.0 | 18.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 27.3 |
| Ben | 5.9 | 1.9 | 16.2 | 11.2 | 6.9 | 0.0 | 59.3 | 16.8 | 0.0 | 13.4 |
| Pierce | 6.7 | 2.9 | 0.0 | 26.6 | 22.3 | 0.0 | 0.7 | 0.0 | 0.0 | 8.4 |
| Maier | 3.9 | 0.0 | 0.0 | 1.9 | 0.0 | 0.0 | 12.4 | 0.0 | 0.0 | 4.3 |
| Dilse | 4.5 | 0.0 | 0.0 | 1.6 | 0.0 | 0.0 | 7.5 | 0.0 | 0.0 | 4.0 |
| Kyle | 3.7 | 0.0 | 0.0 | 4.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 |
| Munich | 0.8 | 46.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.6 |
| Primo Doro | 1.2 | 7.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 27.4 | 0.0 | 1.5 |
| Renville | 1.1 | 0.0 | 0.0 | 0.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 |
| Monroe | 0.9 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 |
| Medora | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 |
| Vic | 0.6 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 |
| Grande Doro | 0.2 | 1.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 |
| Other[2] | 1.7 | 5.4 | 0.0 | 2.4 | 5.4 | 100.0 | 6.9 | 0.0 | 100.0 | 3.2 |
| | | | | | 1,000 ACRES | | | | | |
| All Varieties | 838 | 58 | 24 | 180 | 13 | 0.6 | 162 | 19 | 5.4 | 1,300[3] |

1/ Percentages may not add to 100 due to rounding.
2/ Other includes other varieties not listed and unknown varieties.
3/ Based on June 2006 survey for district level data. Total acres in September 29, 2006 small grains estimate is the same.

## MONTANA

A survey conducted by USDA's Montana Agricultural Statistics Service shows the most popular varieties of durum wheat are Mountrail, Kyle, Lebsock and Alzada. Of the 400,000 acres planted in the state, these four varieties account for 84 percent.

**MOUNTRAIL** is the dominant variety in Montana and is second in North Dakota, at 51 and 27 percent of acres, respectively. Its popularity is primarily contained to major production areas of northwest North Dakota and northeast Montana, where it remains one of the highest yielding varieities. Mountrail is rated average for end-use quality.

**KYLE** remains the second ranked variety in Montana with 16 percent of acres, but down from 2005 levels. Kyle has good end-use quality with competitive yields, but is a tall variety with weak straw.

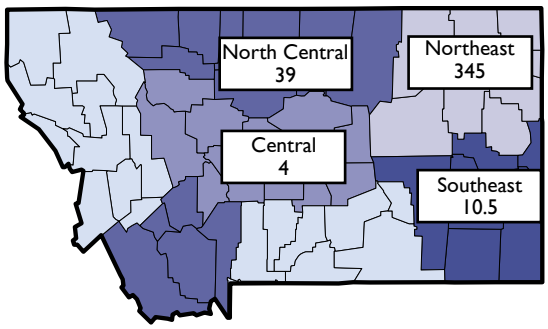
**ALZADA** is the fourth place variety and had the largest percentage growth from 2005, 1.3 to 6.4 percent. It is a 2004 release from Westbred, LLC. Alzada is a semi-dwarf variety noted for its excellent quality which produces a bright yellow semolina.

### DURUM WHEAT VARIETIES PLANTED ACRES IN MONTANA

| VARIETY | 2005 %[1] | 2006 %[1] | 2006 ACRES (1,000) |
|---|---|---|---|
| Mountrail | 52.9 | 51.4 | 205.6 |
| Kyle | 21.3 | 16.2 | 64.8 |
| Lebsock | 5.4 | 9.6 | 38.2 |
| Alzada | 1.3 | 6.4 | 25.7 |
| Pierce | 1.2 | 5.1 | 20.4 |
| AC Avonlea | 5.3 | 2.2 | 9.0 |
| Vic | 0.9 | 1.7 | 6.9 |
| Dilse | – | 0.8 | 3.1 |
| Maier | 0.6 | 0.6 | 2.4 |
| Other & Unknown[2] | 10.9 | 6.0 | 23.9 |
| All Varieties | 100.0 | 100.0 | 400.0 |

1/ Percentages may not add to 100 due to rounding.
2/ Other includes other varieties not listed and unknown varieties.
3/ June and September MASS estimates.

### MONTANA AGRICULTURAL STATISTICS DISTRICTS 2006 PLANTED AREA (1,000 ACRES)




### DURUM WHEAT VARIETIES IN MONTANA SHARE OF 2006 PLANTED ACRES BY CROP DISTRICT

| VARIETY | NORTH CENTRAL | NORTH EAST | CENTRAL | SOUTH EAST | TOTAL STATE |
|---|---|---|---|---|---|
| | | | PERCENTAGE (%)[1] | | |
| Mountrail | 0.0 | 56.7 | 0.0 | 95.0 | 51.4 |
| Kyle | 30.0 | 15.4 | 0.0 | 0.0 | 16.2 |
| Lebsock | 2.4 | 10.8 | 0.0 | 0.0 | 9.6 |
| Alzada | 57.1 | 0.7 | 30.0 | 0.0 | 6.4 |
| Pierce | 0.0 | 5.9 | 0.0 | 0.0 | 5.1 |
| AC Avonlea | 0.0 | 2.6 | 0.0 | 0.0 | 2.2 |
| Vic | 0.0 | 2.0 | 0.0 | 0.0 | 1.7 |
| Dilse | 0.0 | 0.9 | 0.0 | 0.0 | 0.8 |
| Maier | 0.0 | 0.7 | 0.0 | 0.0 | 0.6 |
| Other[2] | 10.5 | 4.3 | 70.0 | 5.0 | 6.0 |
| | | | 1,000 ACRES | | |
| All Varieties | 39 | 345 | 4 | 11 | 400[3] |

1/ Percentages may not add to 100 due to rounding.
2/ Other includes other varieties not listed and unknown varieties.
3/ June and September MASS estimates.

# Handling & Transportation

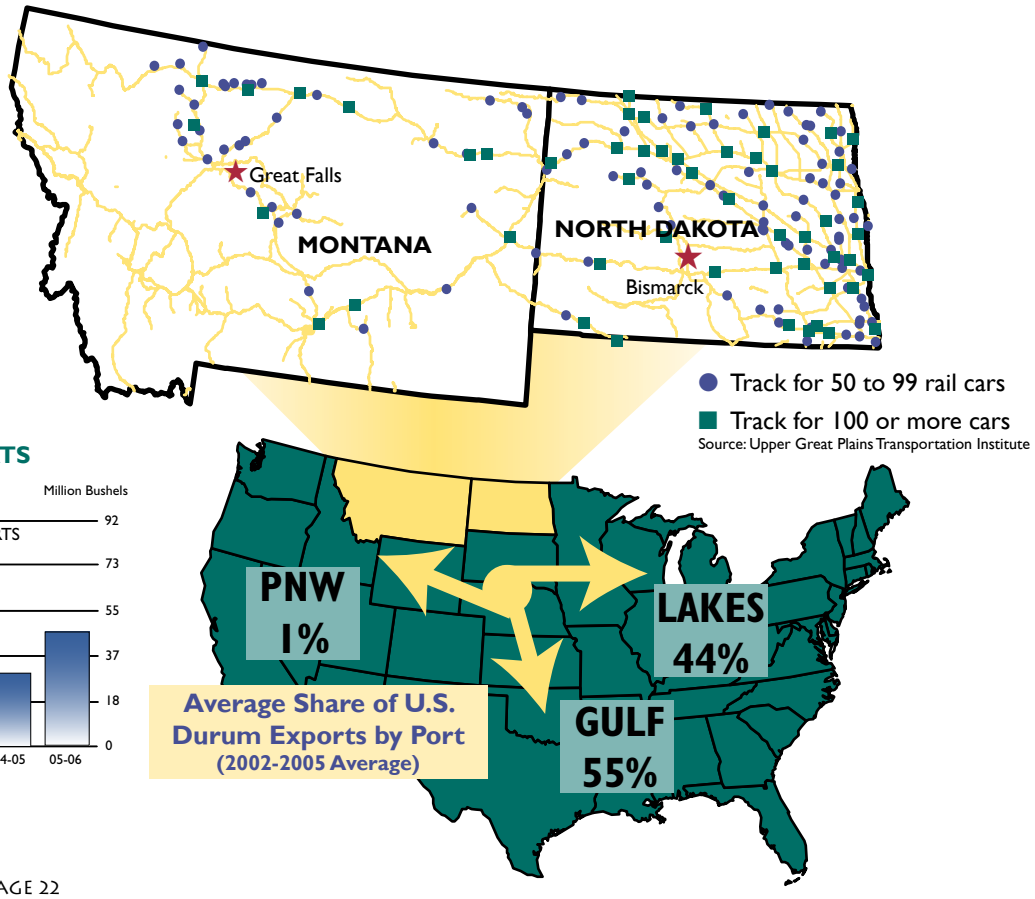
The durum wheat growing region in the Northern Plains has a vast network of country elevators to facilitate efficient and precise movement to domestic and export markets. On average, nearly 80 percent of the region's wheat moves to markets by rail. Duluth is the only export market easily serviced by trucks. Shipments to the Pacific Northwest and Gulf export markets are almost entirely by rail, with some barge movement to the Gulf. The dominant railroad is the Burlington Northern Santa Fe, followed by the Canadian Pacific.

A growing number of elevators in the region are investing to ship 100 car units. Each rail car holds approximately 3,500 bushels (95 metric tons) of wheat. Some of the 100-car shippers have invested in "shuttle" capabilities. Shuttle-equipped facilities receive the lowest rates, sharing volume and transaction efficiencies with the railroad.

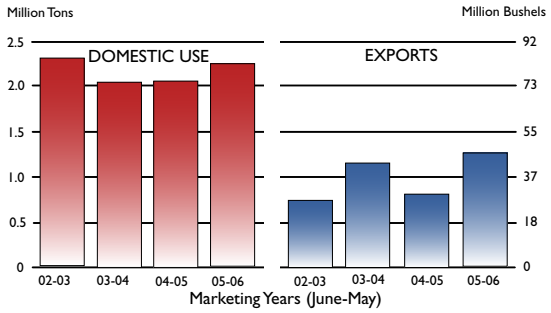
The diverse rail shipping capacities and widespread network of elevators are strengths buyers can capitalize on, especially as their demand heightens for more precise quality specifications and consistency between shipments. Buyers are increasingly exploring origin-specific shipments. Many international buyers now find it possible to request wheat from certain locations to optimize the quality and value of wheat they purchase.

The rail and elevator network in the U.S. northern grown durum region is well suited for meeting the increasing quality demands of both domestic and international customers.

## Grain Handling and Transportation Facilities in the U.S. Northern Grown Durum Region




### 2002-2005 U.S. DURUM DOMESTIC USE & EXPORTS



# FUNDING & SUPPORT

*PROVIDED BY*

*North Dakota Wheat Commission*

*Montana Wheat and Barley Committee*

*U.S. Wheat Associates*