Quality Factors of the 1969 Durum Crop

D. E. Walsh and K. A. Gilles

The overall quality of the 1969 durum wheat crop is considered excellent. In all major quality factors (test weight, vitreous kernels, milling yield and spaghetti color) the crop is better than the 1968 crop and considerably better than the average durum from North Dakota in previous years. Due in part to good weather during the growing season and excellent conditions at harvest time, the crop is particularly high in vitreous kernels and low in moisture content. Leeds is the predominant durum variety in the crop. In commercial channels for the first time last year, Leeds continues to show larger kernels and a brighter spaghetti color than the previously dominant variety Wells.

According to the latest official USDA production estimates, the North Dakota durum crop is a record 92 million bushels (2.7 million metric tons). This represents an increase in production of nearly 6 million bushels over last year's record crop. In average yield, the 1969 crop is estimated at 33.0 bushels per acre which is 5.0 bushels greater than the yield last year and is well above the 5-year average for the state. It is anticipated that about 70% of the crop will grade No. 1 Hard Amber Durum or better, indicating a production of 64 million bushels of No. 1 Hard Amber Durum.

Sample and Methods

During the 1969 harvest, samples were collected and submitted by cooperating elevators from all of the counties producing substantial amounts of durum wheat, with at least two elevators in each county participating. The number of samples collected during an 8-week period reflected the anticipated crop production of each county. Elevator operators were requested to collect and place in suitable containers a sample from each truck load of durum wheat delivered to the elevator. Twice a week the samples were thoroughly mixed and a 2½ pound aliquot was taken, placed in a moisture proof plastic bag and mailed to the Department of Cereal Chemistry and Technology at North Dakota State University, Fargo, N.D., for a complete grade and quality evaluation. These samples were uncleaned and reflected the condition of the grain being delivered to the elevators.

Determinations were made on the individual samples for test weight, dockage, moisture and protein in the Cereal Chemistry and Technology laboratory. Aliquots were taken and submitted to the federally licensed Grain Inspection Department, located on the campus, for an official grade.

To determine the milling, spaghetti processing and other quality tests on this year's crop, measured aliquots of each sample were composited by counties. Samples were milled and processed into spaghetti using continuous laboratory procedures which are comparable to commercial durum processing.

QUALITY DATA FOR COUNTIES

Shown in Table 1 are the average dockage, test weight, moisture, and grading factors for samples received from the major durum producing counties of North Dakota. In test weight, this year's crop was exceptionally high with a range from 60.3 to 63.3 and an average of 62.3 pounds per bushel. The moisture content was low (average of 11.4) and reflected the good drying weather experienced during the harvest season. In addition, the vitreous kernel content was high this year and showed a range from 82% to 97%, with an overall average of 89% vitreous kernels for the state.

In other grading factors, (shrunken and broken kernels, foreign material, damage, defects and wheat of other classes) the 1969 durum crop averages were well below the permissible limits of the top grade*. Foreign material content of the crop was low and ranged from 0.2% to 0.9% with an average of 0.4%. Damaged kernels were quite low, showing an average of only 0.6% which was con-

Dr. Gilles is professor and chairman, Dr. Walsh is assistant professor, Department of Cereal Chemistry and Technology.

*Table 2 lists the official grades and grade requirements for durum wheat as set by the United States government.

Table 1. Durum Wheat Survey - 1969 Crop: Grading Information (County Averages)

Counties	Dockage	Weight Test	Moisture	Grade	Kernels Vitreous	Shrunken Broken and	F.M.	Damage	Defects Total	Classes Contrasting
	%	lbs/bu	%		%	%	%	%	%	%
Barnes	0.5	60.9	10.7	1 HAD	92	0.2	0.5	0.5	1.2	0.0
Benson	1.0	62.2	11.8	1 H HAD	90	0.8	0.4	0.7	1.9	0.0
Bottineau	1.2	62.0	11.6	1 H HAD	86	1.8	0.3	0.5	2.6	0.0
Cass	0.7	61.3	11.3	1 HAD	91	1.5	0.3	0.9	2.7	0.2
Cavalier	0.7	62.3	12.3	1 H HAD	78	1.3	0.5	0.6	2.3	0.1
Dickey	1.8	60.3	10.6	1 HAD	94	1.1	0.4	0.6	2.2	0.0
Divide	0.9	62.4	10.8	1 H HAD	87	1.3	0.4	0.5	2.1	0.5
Foster	1.3	63.1	11.4	2 H HAD	91	0.9	0.4	0.8	2.0	1.7
Grand Forks	0.7	63.2	11.7	2 H HAD	82	2.5	0.4	0.4	3.2	0.0
Griggs	1.3	62.5	11.7	1 H HAD	94	0.8	0.4	0.8	2.0	0.0
LaMoure	0.1	62.2	11.8	1 H HAD	97	0.3	0.2	0.5	1.0	0.0
McLean	1.3	62.5	11.1	1 H HAD	91	0.7	0.3	0.8	1.8	0.0
Mountrail	1.2	62.3	11.0	1 H HAD	88	1.8	0.4	0.4	2.6	0.4
Nelson	0.9	63.0	11.5	1 H HAD	89	0.6	0.3	0.5	1.4	0.0
Pembina	1.2	62.8	12.0	1 H HAD	92	0.5	0.4	0.7	1.6	0.0
Pierce	1.6	62.3	11.6	2 H HAD	88	1.7	0.4	1.3	3.4	0.2
Ramsey	1.2	62.2	11.5	1 H HAD	93	1.2	0.3	0.5	2.1	0.0
Renville	0.6	62.6	11.2	1 H HAD	91	2.1	0.3	0.7	3.0	0.9
Rolette	1.2	61.4	11.8	2 HAD	84	2.1	0.3	0.7	3.1	0.0
Stutsman	1.3	63.3	11.2	1 H HAD	92	1.2	0.3	0.7	2.2	0.0
Towner	1.6	61.5	12.3	1 HAD	83	1.7	0.4	0.5	2.6	0.1
Walsh	1.6	62.4	11.7	1 H HAD	86	1.5	0.4	0.3	2.2	0.2
Ward	0.5	63.1	11.6	1 H HAD	86	1.0	0.3	0.7	2.0	0.0
Wells	1.9	62.3	11.3	2 H HAD	84	2.2	0.9	0.4	3.5	0.4
Williams	1.3	62.3	10.5	1 H HAD	90	1.5	0.2	0.4	2.1	0.1
Average	1.1	62.3	11.4	1 H HAD	89	1.3	0.4	0.6	2.3	0.2

Table 2. Grades and Grade Requirements for Durum Wheat (Effective March 5, 1965)

Grade	Minimum test weight per bushel	Maximum limits of Defects: Heat damages kernels	Damaged kernels (total)	Foreign material	Shrunken and broken kernels	Defects (total)	Wheat of Other Classes: Contrasting classes	Wheat of other classes (total)
	pounds	percent	percent	percent	percent	percent	percent	percent
1	60.0	0.1	2.0	0.5	3.0	3.0	1.0	3.0
2	58.0	0.2	4.0	1.0	5.0	5.0	2.0	5.0
3	56.0	0.5	7.0	2.0	8.0	8.0	3.0	10.0
4	54.0	1.0	10.0	3.0	12.0	12.0	10.0	10.0
5	51.0	3.0	15.0	5.0	20.0	20.0	10.0	10.0

Sample Grade: Sample grade shall be wheat which does not meet the requirements for any of the grades from No. 1 to No. 5, inclusive; or which containes stones; or which is musty, or sour, or heating; or which has any commercially objectionable foreign odor except of smut or garlic; or which contains a quantity of smut so great that any one or more of the grade requirements cannot be applied accurately; or which is otherwise of distinctly low quality

siderably lower than the value reported for the 1968 crop. Inasmuch as total defects is the sum of shrunken and broken kernels, foreign material and damaged kernels, it can be used as a general index of wheat condition. This important grading factor ranged from 3.5% to 1.0%, and averaged only 2.3% which indicated that the crop was generally in excellent overall condition. Wheat of contrasting classes in the durum samples was negligible (less than 1%). In official grade, the crop ranged from No. 1 Heavy Hard Amber Durum to No. 2 Hard Amber Durum and showed a theoretical

average grade for the state of No. 1 Heavy Hard Amber Durum.

Table 3 shows the wheat quality factors used for assessing the quality of the durum crop. Included for comparative purposes are test weight, hectoliter weight, 1000 kernel weight, kernel distribution, mineral content (ash), and wheat protein. An appendix included in this report lists the methods employed in determining the various quality factors. Hectoliter weight of this year's crop was high and ranged from 80.1 to 84.1 with an average of 82.7 kilograms per hectoliter. Moreover, the thousand kernel weight was higher than last year and averaged 34.7 grams for the state.

Kernel distribution, which gives still another indication of kernel size, separates the wheat into three sizes, large, medium and small, according to their diameters. For desirable milling properties, durum wheat should have a preponderance of uniform sized kernels and a relatively small amount of the small size. According to the average data, the kernel size is rather uniform (24%, 69% and 7% large, medium, and small sized kernels, respectively). The average protein content for this year's crop is 13.3% which is the same as last year's crop. For illustrative purposes, Figure 1 shows a map of North Dakota listing the average protein content and test weight for the major durum producing counties.

Table 3. Durum Wheat Survey - 1969 Crop: Wheat Data (County Averages)

Counties	Test Weight	Hecto-liter Weight	1000 Kernel Weight	Kernel Distribution			Protein	Mineral Content (Ash)
				Large	Medium	Small		
	lbs/bu	Kg.	g.	%	%	%	%	%
Barnes	60.9	80.9	37.6	29	67	4	13.2	1.69
Benson	62.2	82.7	34.8	27	66	7	13.5	1.69
Bottineau	62.0	82.4	32.7	14	76	10	12.8	1.77
Cass	61.3	81.5	33.8	17	78	5	13.1	1.84
Cavalier	62.3	82.8	34.7	25	67	8	12.6	1.69
Dickey	60.3	80.1	33.3	13	74	13	15.1	1.78
Divide	62.4	82.9	35.6	19	73	8	13.0	1.67
Foster	63.1	83.8	33.4	24	69	7	13.8	1.74
Grand Forks	63.2	84.0	38.6	45	52	3	12.9	1.76
Griggs	62.5	83.1	36.9	30	66	4	14.3	1.69
LaMoure	62.2	82.7	35.6	31	66	3	14.1	1.78
McLean	62.5	83.0	33.1	15	76	9	13.8	1.71
Mountrail	62.3	82.7	32.7	14	77	9	13.0	1.91
Nelson	63.0	83.7	35.7	29	67	4	12.9	1.70
Pembina	62.8	83.4	38.0	42	56	2	13.6	1.66
Pierce	62.3	82.8	32.9	20	70	10	12.9	1.67
Ramsey	62.2	82.7	37.2	27	67	6	13.7	1.63
Renville	62.6	83.2	33.8	20	72	8	13.4	1.78
Rolette	61.4	81.6	32.1	14	78	8	12.9	1.76
Stutsman	63.3	84.1	35.6	28	67	5	13.8	1.72
Towner	61.5	81.6	32.2	19	72	9	12.8	1.68
Walsh	62.4	82.8	35.0	30	66	4	12.5	1.66
Ward	63.1	83.9	34.8	25	69	6	13.5	1.75
Wells	62.3	82.8	33.3	25	68	7	13.0	1.79
Williams	62.3	82.7	34.5	29	63	8	13.4	1.71
Average	62.3	82.7	34.7	24	69	7	13.3	1.73

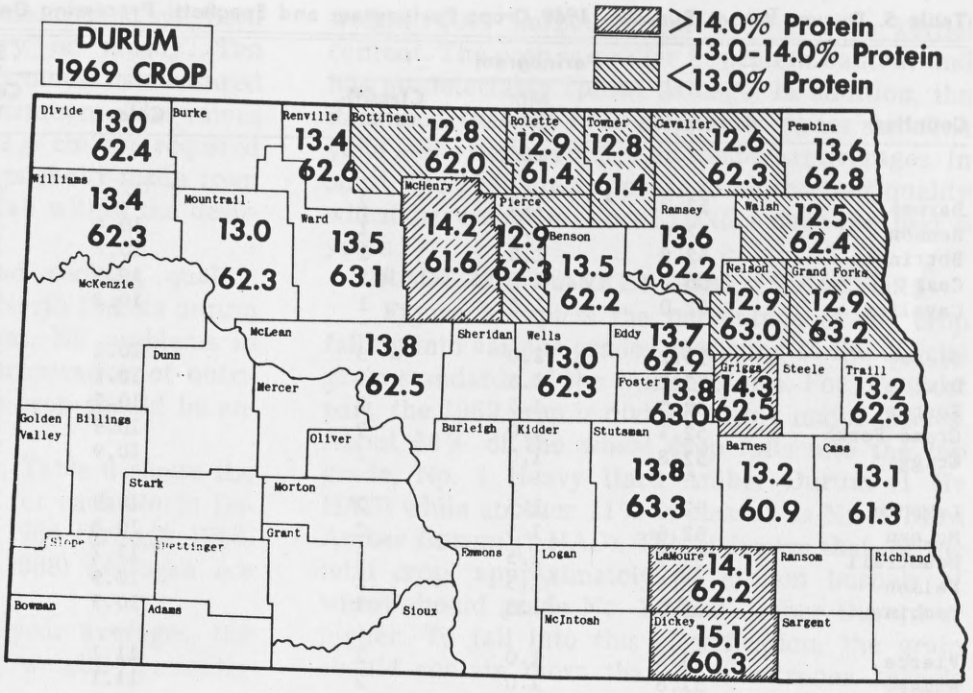

Figure 1. The average protein content and test weight for wheat from the major durum producing counties of North Dakota. In each county, the upper number indicates the protein, the lower shows the test weight.

Semolina Tests

Table 4 shows semolina quality data for each county, as well as the overall state averages. Included are test data for semolina milling yield, mineral content (ash), specks, protein and wet gluten contents, and falling number. In the overall state average for semolina milling yield, the 1969 crop is up somewhat from last year. This reflects the higher vitreous kernel content and better general condition of the 1969 crop. The mineral content of the semolina averages 0.63% which is a typical value for durum semolina. The speck count, a measure of the number of bran particles remaining in the semolina after milling, is rather low. It averages 15 for the state and ranges from 30 to 10 specks per 10 square inches. When considered along with the high semolina yield, the low speck counts indicate that the crop is very good in overall milling quality.

Table 4. Durum Wheat Survey — 1969 Crop: Semolina Data (County Averages).

Counties	Yield	Mineral Content (Ash)	Specks	Protein	Wet Gluten	Falling No.
	%	%		%	%	units
Barnes	57.5	.68	17	12.2	35.7	479
Benson	56.4	.62	17	12.4	35.1	468
Bottineau	55.6	.66	10	11.8	33.6	481
Cass	56.8	.70	17	12.1	34.4	475
Cavalier	56.3	.63	13	11.6	35.0	479
Dickey	55.2	.67	30	13.9	37.6	479
Divide	55.0	.61	13	11.8	32.1	459
Foster	56.6	.62	10	12.6	36.9	478
Grand Forks	56.7	.61	10	12.0	37.0	479
Griggs	56.4	.60	10	13.3	30.9	488
LaMoure	56.0	.63	17	13.1	34.5	465
McLean	55.4	.63	10	12.7	35.4	487
Mountrail	55.7	.62	13	11.8	35.5	477
Nelson	57.4	.61	10	12.0	33.2	489
Pembina	56.7	.61	17	12.4	31.2	487
Pierce	56.2	.61	23	12.0	37.9	456
Ramsey	55.3	.63	13	12.6	36.8	486
Renville	55.1	.66	13	12.3	37.7	462
Rolette	54.6	.65	17	11.9	37.1	466
Stutsman	55.7	.63	13	12.8	39.5	458
Towner	54.9	.61	17	11.9	37.0	475
Walsh	51.8	.62	13	11.7	34.7	476
Ward	55.6	.60	13	12.3	37.5	429
Wells	55.0	.64	20	12.1	36.0	457
Williams	55.9	.62	17	12.3	35.1	428
Average	55.8	.63	15	12.3	35.5	471

The protein and wet gluten contents were both at acceptable levels for good quality durum wheat. Falling number, a test used for detecting sprout damage, showed the 1969 durum crop to be essentially free of sprout damage. This was expected since the weather during the harvest was dry and not conducive to sprouting.

Spaghetti Processing Tests

Table 5 lists the average farinogram and spaghetti processing data for the counties as well as the overall averages for the state. Farinograms show an average absorption of 52.8% and a mixing time of 1.4 minutes with overall farinogram classification of 2. Figure 2 shows a typical farinogram

Table 5. Durum Wheat Survey - 1969 Crop: Farinogram and Spaghetti Processing Data (County Averages).

Counties	Farinogram			Spaghetti Processing			
	Absorption	Mix Time	Classification	Color	Cooked Wt.	Cooking Loss	Firmness
	%	min.			g.	%	g. cm.
Barnes	52.2	1.5	2	10.9	35.7	7.4	3.9
Benson	52.6	1.5	1	10.4	39.2	8.5	3.3
Bottineau	52.8	1.0	1	10.7	35.7	8.2	4.7
Cass	56.4	2.0	2	10.6	36.4	7.5	3.8
Cavalier	52.0	1.5	1	10.8	35.5	7.5	3.9
Dickey	55.2	2.0	3	10.2	36.4	7.2	5.0
Divide	53.2	1.5	3	10.1	36.6	6.8	4.8
Foster	52.0	1.5	2	10.7	34.7	6.4	4.0
Grand Forks	52.4	1.0	2	10.9	35.3	7.1	4.1
Griggs	52.8	1.0	2	10.9	36.1	6.8	4.4
LaMoure	52.4	1.5	2	10.9	36.6	6.2	4.4
McLean	52.6	1.5	2	10.8	36.2	7.2	4.1
Mountrail	53.2	1.5	2	11.2	34.4	7.1	4.7
Nelson	52.4	1.5	2	10.9	37.1	6.9	3.9
Pembina	53.0	1.5	2	10.9	36.6	7.0	4.2
Pierce	53.2	1.0	2	11.1	36.4	6.4	3.7
Ramsey	51.8	1.0	2	11.1	35.4	6.0	4.4
Renville	52.8	1.0	2	11.0	35.2	5.8	4.2
Rolette	52.8	1.5	2	11.0	37.4	8.0	4.2
Stutsman	51.8	1.0	2	11.2	35.8	6.8	4.5
Towner	51.6	1.0	2	11.2	35.2	6.7	4.1
Walsh	51.4	1.0	2	11.0	37.5	7.8	3.9
Ward	52.6	2.0	2	11.1	35.6	7.0	4.7
Wells	53.4	1.5	2	11.0	35.6	7.1	3.7
Williams	53.8	1.5	2	11.0	36.3	8.0	4.4
Average	52.8	1.4	2	10.9	36 1	7.1	4.2

pattern for the 1969 crop. The pattern indicates that the durum has a mellow type gluten which characteristically performs well under modern pasta processing conditions.

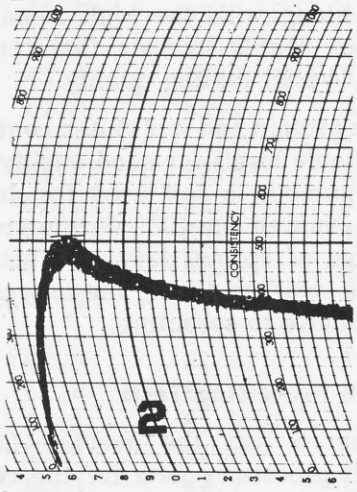

Figure 2. Farinogram showing average mixing pattern of the 1969 durum crop.

In processing spaghetti, a new semi-commercial scale continuous extrusion press was used. In the press, ingredients were mixed under vacuum and extruded through a teflon spaghetti die. More important, the conditions were controlled and closely followed modern commercial processing procedures. All samples showed excellent extrusion properties. Moreover, no cracking or checking was found while drying the spaghetti.

The color and appearance of the finished, dry spaghetti was excellent. All samples had a deep, clear, yellow color and showed color scores which ranged from 10.1 to 11.2. Most important, the 1969 state average color score (10.9) was considerably higher than the score (9.3) for the crop a year ago.

The data in Table 5 reported the cooked weight, cooking loss and firmness of cooked spaghetti. Cooked weight averaged 36.1 g. for the state. Moreover, a relatively low average cooking loss (7.1%) was noted for the crop. These data showed the spaghetti had good swelling properties and did not disintegrate during cooking.

Another important cooking quality characteristic of spaghetti is firmness. This refers to the organoleptic properties or "bite" of cooked spa-

ghetti. According to connoisseurs, cooked spaghetti should be firm but not "rubbery" or "mushy". The data shown in Table 5 reports firmness as measured with a laboratory shearing instrument. The values indicate that on the average 4.2 g. cm. are required to shear a cooked strand of spaghetti made from the 1969 crop. This value is well within the desirable limits for firmness.

In overall processing and cooking quality, spaghetti made from the 1969 North Dakota durum crop was found to be excellent. No problems in either the processing or the preparation of nutritious products from this year's crop should be encountered.

For comparative purposes, Table 6 shows the pertinent average quality data for each North Dakota durum wheat crop from 1964 through 1969. In addition, the 5-year (1964-1968) averages are shown.

In comparison with the 5-year averages, the 1969 crop is higher in test weight, hectoliter weight, 1000 kernel weight and vitreous kernel content. The crop is similar in protein content and has no detectable sprout damage. In addition, the data show that the 1969 crop has a higher semolina yield and a better color than the 5-year averages. In short, the 1969 crop appears to be the best quality wheat harvested in North Dakota over the past 5 years.

GRADE AND MARKET QUALITY FACTORS

Figure 3 depicts the percentage of the crop falling into various grades according to the official grain standards of the United States. For the most part, the 1969 crop is divided into 4 major grades. About 58% of the wheat crop falls into the top grade, No. 1 Heavy Hard Amber Durum (1 Hv HAD) while another 11% is classed as No. 1 Hard Amber Durum (1 HAD). This indicates that, of the total crop, approximately 64 million bushels of wheat should grade No. 1 Hard Amber Durum or higher. To fall into this classification, the grain should contain more than 75% vitreous kernels

Table 6. Durum Wheat Survey: Comparison of Average Quality Factors for North Dakota 1964, 1965, 1966, 1967, 1968 and 1969 Crops.

(Milling and Analytical Data)

Crop Year	Test weight	Hecto-liter weight	1000 Kernel weight	Vit. kernels	Wheat protein	Falling number	Sprout damage
	lbs/bu	kg.	g.	%	%	units	%
1964	59.5	79.1	28.4	88	13.8	-	0.0
1965	58.8	78.1	30.0	71	13.2	280	4.5
1966	59.6	79.1	28.2	74	13.6	272	4.0
1967	61.3	81.4	31.1	85	13.5	431	0.0
1968	59.5	79.1	32.0	74	13.3	260	3.5
1969	62.3	82.7	34.7	89	13.3	471	0.0
5-year Ave.	59.7	79.4	29.9	78	13.5	-	2.4

(Semolina, Macaroni and Physical Dough Data)

Crop Year	Semolina yield	Semolina protein	Mineral Content (ash)	Semolina specks	Spaghetti color	Farinogram Classification
	%	%	%			
1964	59.8	13.2	0.78	32	9.1	4.0
1965	54.0	12.4	0.63	21	9.5	3.0
1966	56.3	12.5	0.68	16	9.6	3.7
1967	54.8	12.6	0.61	14	9.8	3.0
1968	51.5	12.4	0.62	21	9.3	2.4
1969	55.8	12.3	0.63	15	10.9	2.0
5-year Ave.	55.3	12.6	.66	21	9.5	3.2

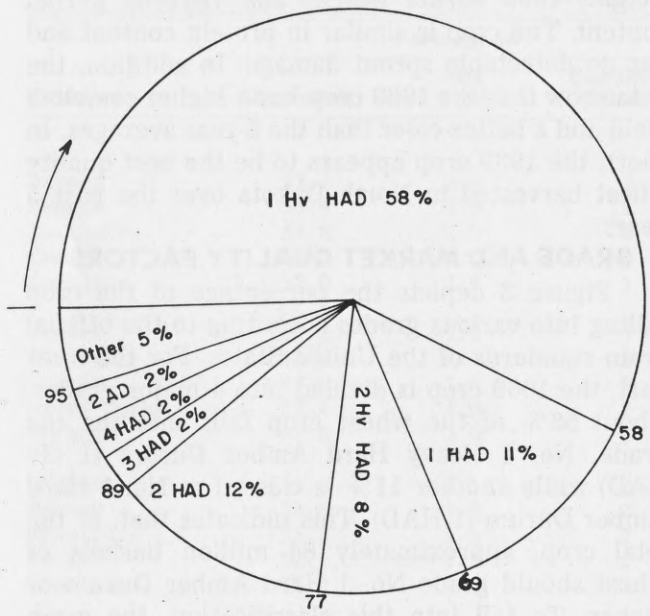

Figure 3. Diagram showing the durum wheat grade distribution of the 1969 crop.

and have a test weight of at least 60 pounds per bushel. Of the wheat in the remaining grades, 8% is classed as No. 2 Heavy Hard Amber Durum, 12% as No. 2 Hard Amber Durum and 11% as No. 3 Hard Amber Durum or lower.

WEATHER AND HARVEST

To acquaint the reader with seeding, growing and harvesting conditions encountered in 1969, a brief resumé is presented.

Largely due to an excessive winter snow fall and wet conditions in the spring, the seeding of durum wheat was slightly later than usual. By April 20, only 1% of the crop was planted compared to 24% for the same date last year. However, by May 20, nearly 78% of the durum seeding was done and by the end of May, the seeding was essentially completed.

During June, July and early August, good growing conditions prevailed. Adequate moisture supply in the soil as well as warm weather was reported in most areas. Toward the latter part of August, warm, dry weather was favorable for maturing and drying the grain. Harvesting conditions were excellent during late August and early September. According to the "North Dakota Weekly Weather and Crop Report", the durum harvest was 94% completed by September 14. As the new wheat began to reach local elevators and storage points, it became apparent that the durum crop was of excellent physical quality. In addition, it was relatively free of diseased or damaged kernels and quite low in moisture. Estimates by the USDA placed the North Dakota durum wheat production for 1969 at a record 92 million bushels. This represented 9 million more bushels of durum than last year's crop and was 29 million bushels greater than the 5-year average for the state. Due to ideal weather in 1969, especially during the harvest, the crop was essentially free of damaged kernels and has excellent milling and processing qualities.

Summary

Due to excellent weather and expanded acreage, a record crop of 92 million bushels of durum wheat was produced in North Dakota during 1969. Moreover, the good weather prevailing, especially through harvest time, resulted in one of the best quality durum crops of recent times.

Characteristically, the 1969 North Dakota durum crop has high test weight, low moisture, and a high content of large, vitreous kernels. It is estimated that nearly 70% of the crop would grade No. 1 Hard Amber Durum or better. The crop is generally free from damaged kernels, has low average dockage (about 1%) and shows a higher 1000 kernel weight than the average of the North Dakota durum crops harvested in the past five years.

In milling and processing quality, this year's durum is considered excellent. The wheat has normal milling properties and yields bright yellow semolina having few specks.

In processing, the sembolina has very good characteristics and results in smooth, bright yellow spaghetti with good cooking qualities. The predominant variety in the crop is Leeds which has exceptionally high color and good processing quality.

In short, the 1969 durum crop is considerably better than the 5-year average in all quality factors.

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In addition, the financial assistance of the North Dakota Wheat Commission is gratefully acknowledged.

METHODS - DURUM

WHEAT

Test Weight per Bushel: Cereal Laboratory Methods (CLM)*; method 84-10.

Hectoliter Weight: Calculated from the test weight per bushel.

Thousand Kernel Weight: Ten grams of cleaned wheat (free from foreign material and broken kernels) are counted using an electronic seed counter. The calculated weight for 1,000 kernels is reported.

Kernel Size (2-10 x 20 sieve): This sieve, which is used extensively in Europe, is a metal sieve with slotted holes 2.1 mm wide by 20 mm long with 84 perforations per 10 sq. cm. One hundred grams of wheat are placed on the sieve which is rotated 30 times. The material passing through the sieve is reported.

Kernel Distribution: One hundred grams of cleaned wheat are placed in a unit similar to the one described in Cereal Science Today, Vol. 5, No. 3, 71-75 (1960). The operation time is 3 minutes. Wheat remaining on the top sieve (Tyler No. 7, with 2.92 mm. opening) is classified as "large"; material passing through the top sieve but remaining on the second sieve (Tyler No. 9, with 2.24 mm. opening) are the "medium" sized kernels; the kernels passing through the second sieve are classed as "small". The weighed fractions are reported.

Grade: The grade is determined by a United States licensed inspector using the Official Grain Standards of the United States (SRA-AMS-177) as revised May, 1964.

Vitreous Kernels (Vit. Kernels): The vitreous kernels from 50 grams of wheat are hand picked, weighed and reported.

Protein: CLM method 46-10, expressed on 14.0 per cent moisture basis.

SEMOLINA

Yield: CLM, method 26-30 (Long flow procedure)

Ash: CLM method 08-01 expressed on 14.0 per cent moisture basis.

Protein: CLM, method 46-10 expressed on 14.0 per cent moisture basis.

Wet Gluten: CLM, method 38-11 expressed on 14.0 per cent moisture basis.

Diastatic Activity: CLM, method 22-15. Results reported as milligrams maltose per 10 g. of flour.

Specks: An aliquot of experimentally milled and purified semolina is thoroughly mixed - a 1 inch square is marked on a 3 x 4 inch glass plate - the plate is pressed down on the semolina and the number of specks within the designated area are counted - the determination is replicated three times, and the average multiplied by 10. Expressed as specks per 10 square inches.

Falling Number: Flour is obtained by passing the wheat through a Brabender Quadramat Jr. mill and sifting the ground whole wheat through a No. 70 US standard sieve (200u). The procedure, described in Cereal Chem. 38, 202-203 (1961) requires 7.0 g. flour (15.0% M.B.) and 25 ml. distilled water. Results are expressed in units (seconds).

SPAGHETTI

Processing: Semolina samples (2000 g.) were processed into spaghetti using a DeMaco continuous semi-commercial scale vacuum pasta extruder. All samples were processed with an absorption of 32% and extruded through a teflon spaghetti die. Spaghetti was dried at 100°F. for 15 hr. in a spaghetti dryer which automatically lowered the relative humidity (R.H.) in the cabinet through a continuous gradient from 95% R.H. at the beginning to 60% R.H. at the end of the drying cycle.

Color: Color scores were determined by light reflectance, using a Hunter Color-Difference Meter (Model D25) equipped with a D 25 A optical unit. The entire 2 in. diameter specimen area was covered with spaghetti strands, readings were taken against a black background having zero per cent reflectance. (These color scores have a high correlation with the visual scores reported in previous reports). Highest score is 12.0.

Cooked Weight: The weight of ten grams of spaghetti after twenty minutes of cooking in 300 ml. of boiling distilled water. Results are expressed in grams.

Cooking loss: The amount of solids lost to the cooking water during the cooking (as outlined above). The cooking water is evaporated to dryness and the residue weighed and reported on a percentage basis.

Firmness: This is a relative score obtained with the use of a new laboratory "shearing" instrument. Results are expressed as gram centimeters.

FARINOGRAM

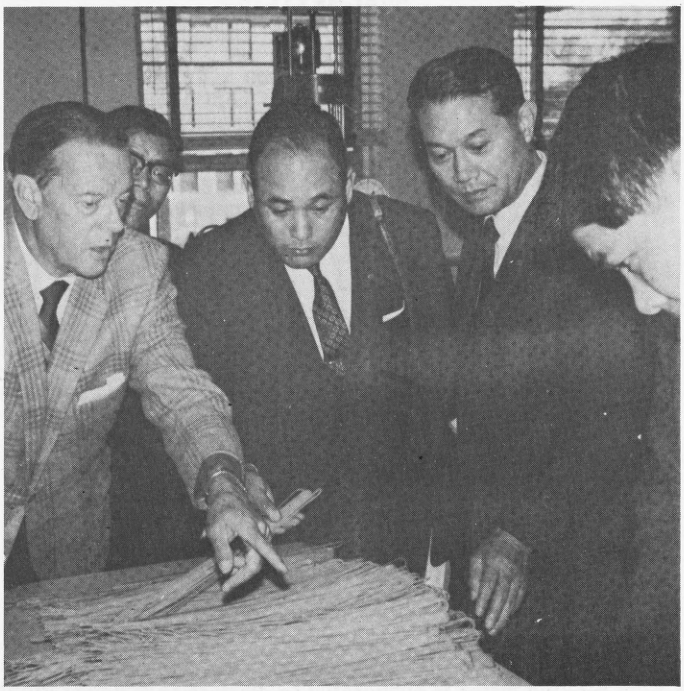
Procedure: Water-semolina farinograms are made using the settings on the Farinograph which are normally employed for hard red spring wheat flours. Fifty grams of semolina are mixed in a small stainless steel Farinograph bowl with sufficient distilled water to give a maximum dough consistency centered on the 460 Brabender Unit Line.

Absorption: Amount of water (ml.) required to center curve peak on the 460 Brabender Unit Line.

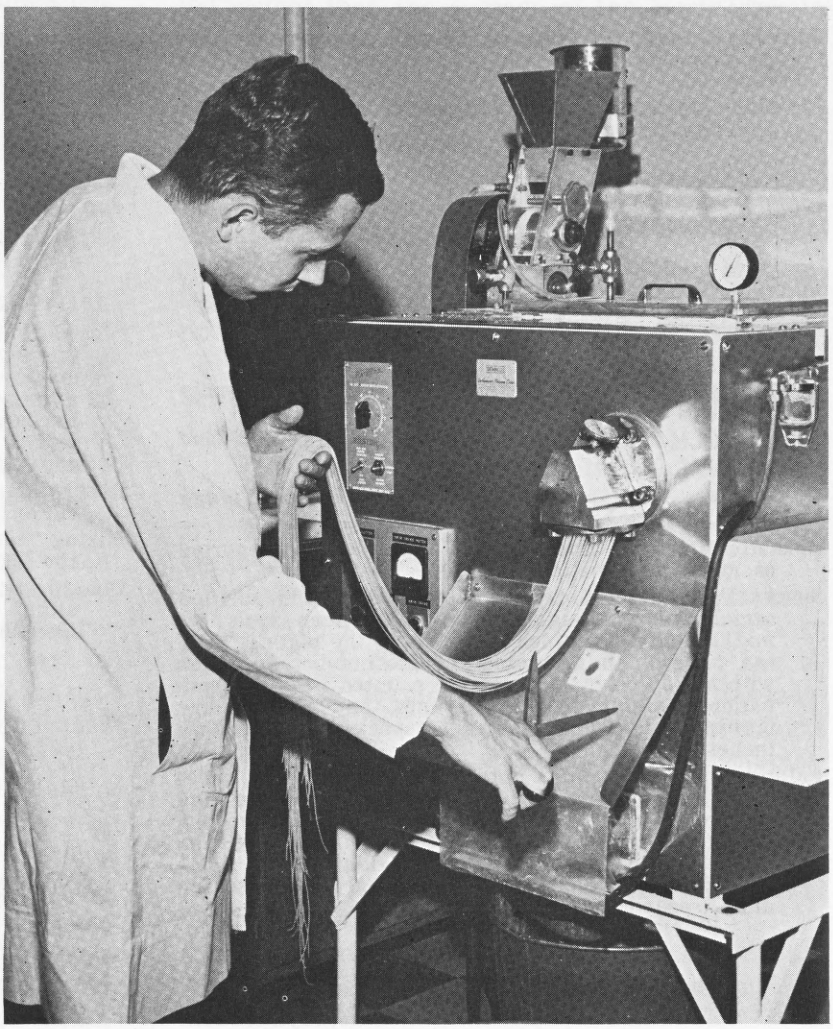
Mixing Time: Time in minutes for the center portion of the farinogram to reach the 460 Brabender Unit Line.

Classification: An overall empirical classification incorporating mixing time and general charactristics is assigned.

*American Association of Cereal Chemists, Cereal Laboratory Methods (7th Edition) St. Paul, Minn., 1962.



Trade missions and scientists from many countries come to see the durum wheat research being conducted in North Dakota.



Spaghetti samples are processed using semi-commercial scale equipment.