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Objective
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Wheat Quality: Trends and Issues

Linda M. Young

Introduction

Quality is one factor that influences demand for U.S. wheat on the domestic and international markets. This paper assesses changes in the quality of the U.S. wheat supply and exports over the past decade. Projections of future global wheat demand and implications for the quality demanded are discussed.

Attributes of grain quality include the class of wheat, characteristics determining its grade, and characteristics that are not grade-determining. Grade-determining characteristics include test weight, defects and insect damage, and inclusion of foreign matter such as stones, other material, and wheat of other classes. Quality characteristics that are not grade-determining include protein, dockage, moisture, and ash content. However, protein levels are commonly specified by buyers, and the protein level is important in determining the price.

How Have Quality Attributes of U.S. Wheat Production Changed?

The production of hard red spring wheat has doubled since 1983, from 13 percent to 27 percent of the U.S. wheat supply.

Changes in the importance of wheat classes. There are year-to-year swings in the importance of the various classes of wheat in the U.S. wheat supply. Weather conditions contribute to this variation. However, some distinct trends are observed. In 1983 hard red winter accounted for 50 percent of all wheat produced in the United States as compared to 33 percent in 1996. In contrast, the production of hard red spring wheat has doubled since 1983, from 13 percent to 27 percent of the U.S. wheat supply (see Figure 4). The shares of other wheat classes have remained relatively constant over the 1983 through 1996 period.

Changes in the grades and other quality attributes. A consistent data series on the breakdown of the U.S. wheat supply by grades is not collected by any government agency or commodity group. Data on the quality of the U.S. wheat supply are limited to a survey undertaken by U.S. Wheat Associates and are reported yearly in *Crop Quality Reports*. Sample data on test weight, dockage, moisture, and protein of the U.S. hard red spring crop indicate some variation by year, but there is little evidence of sustained changes in these attributes over the past ten years (see Table 5). The standard deviation, a measure of variability, is reported for the quality attributes for both the U.S. supply and U.S. exports. The standard deviations indicate that there may be slightly more variation in quality characteristics, such as test weight per bushel, associated with production than with exports. However, the variation in the quality attributes is minimal for both supply and exports.

Figure 4. U.S. Wheat Supply, Percentage by Class

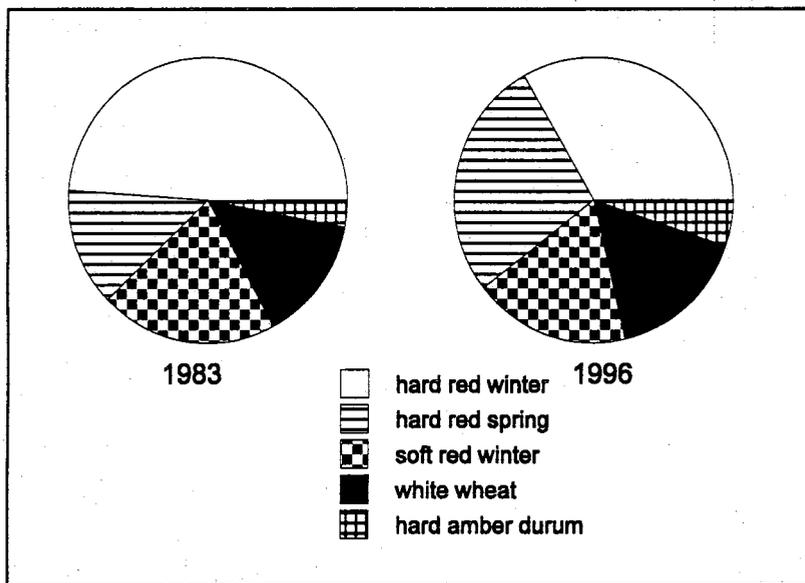


Table 5. Quality Attributes of U.S. Hard Red Spring Wheat Supply and Exports, 1988-1997

Hard Red Spring		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	Standard Deviation
Test Weight (lb/bushel)	supply	59.5	59.9	60.9	59.7	60.3	58.2	60.1	59.6	61.5	59.7	.88
	export	60.6	60.5	60.5	61.0	60.5	60.6	59.8	60.0	60.2	61.0	.39
Dockage %	supply	1.7	0.9	0.8	1.8	1.0	1.5	2.6	3.5	1.9	3.0	.91
	export	0.9	0.8	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.7	.06
Moisture %	supply	10.8	11.4	11.4	11.6	13.2	13.0	12.2	12.8	12.6	12.1	.79
	export	11.9	11.7	11.7	11.7	11.7	12.7	12.9	12.5	12.4	12.5	.47
Protein (12% moisture)	supply	16.1	15.3	14.2	14.5	13.7	14.1	14.0	13.8	13.9	14.1	.76
	export	14.0	14.4	14.8	14.6	14.4	14.0	13.9	13.8	13.8	14.0	.35

*Note: Exports are hard red spring, #2ob.

Source: U.S. Wheat Associates and the Federal Grain Inspection Service.

How Have the Quality Attributes of U.S. Wheat Exports Changed?

Changes in the importance of wheat classes. Mirroring the changes in U.S. wheat production have been changes in the relative importance of the classes of wheat exported. Exports of hard red winter have declined as a percentage of U.S. wheat exports (Wilson and Dahl 1997). Hard red winter wheat accounted for 60 percent of total U.S. exports in 1982–1983, declining to 27 percent by 1996–1997. In contrast, exports of hard red spring, as a percentage of total U.S. exports, have increased—from 17 percent in 1982–1983 to 27 percent in 1996–1997, closely following the increase of hard red spring in domestic supply.

Change in the grade of wheat exported is evident for hard red spring and, to a lesser degree, for hard red winter and white wheat.

A complete investigation of the reasons for the change in the proportion of U.S. hard red winter and hard red spring in U.S. wheat exports has not been undertaken. However, it is likely that the impact of U.S. domestic commodity policy on the U.S. supply of hard red winter wheat was an important contributing factor. Hard red winter wheat yields have declined in several important wheat-producing states, including Oklahoma and Kansas. Epplin has investigated the impact of U.S. domestic farm programs on production practices in Oklahoma. He found that domestic commodity programs provided an incentive for increased grazing of winter wheat acres. Changes in production practices to maximize both grazing and wheat production included moving forward the planting date for wheat and the selection of different wheat varieties. These factors led to a decline in winter wheat yields (Epplin 1997).

Changes in the grade of wheat exported. Changes have also occurred in the grades of wheat exported, with an increase in the proportion of total wheat exported as grade No. 1 and a corresponding decrease in the proportion of wheat exported as the grade No. 2 or better. The grade No. 2 or better means that the wheat exported meets the specifications for Grade 2 or a higher quality. A large proportion of U.S. wheat is exported as No. 2 or better, as it gives the exporting company flexibility to ship a higher grade of wheat if they choose. Importers use No. 2 or better as a way to specify minimum requirements for desired quality characteristics without buying grade No. 1.

Change in the grade of wheat exported is evident for hard red spring and, to a lesser degree, for hard red winter and white wheat. Changes over time in the percentage of exports by grade within each class can be observed by comparing the years 1982–1983 with 1996–1997 (see Table 6). No change over time is observed in the proportion of grades exported for soft red winter.

Examination of the data on U.S. exports to the top 25 importers of U.S. wheat indicate that only two importers have made a significant change in the grade of wheat imported. South Korea imported 95 to 100 percent of its hard red winter wheat imports as No. 2 or better until 1989–1990. Since that time 95 to 100 percent of its hard red winter imports have been grade No. 1. The same abrupt switch from grade No. 2 or better to No. 1 is evident in South

Table 6. U.S. Wheat Exports, by Grade

Wheat Class	Years	Exports by Grade (%)	
		No. 1	No. 2 or better
Hard Red Spring	1982-1983	1	98 ^a
	1996-1997	15	73
Hard Red Winter	1982-1983	1	99
	1996-1997	9	90
Soft Red Winter	1982-1983	0	98
	1996-1997	0	95
White Wheat ^b	1990-1991	7	93
	1996-1997	11	87

^aFigures do not add to 100 percent due to the exclusion of Grade #3.

^bYears for white wheat differ as it was introduced as a class for data collection in 1989.

Korean imports of hard red spring. Mexico has shown an increase in the amount of No. 1 and No. 2 wheat imported. However, Mexico still imports mostly No. 2 or better. Other U.S. importers continue to import No. 2 or better almost exclusively.

Examination of U.S. wheat export data indicate changes in the classes of wheat exports and a shift toward exports of higher grades (Wilson and Dahl 1997). It would be useful to compare changes in U.S. exports of wheat with changes in world imports of wheat by class and grade. However, the data necessary to do so are not consistently reported.

Future Import Demand

In 1996, developing countries accounted for 78 percent of world wheat imports and 75 percent of U.S. wheat exports. The importance of developing countries in world markets is expected to grow. The Food and Agriculture Policy Research Institute (FAPRI) makes projections of world agricultural trade. The FAPRI projection is that wheat imports will increase by 20 million metric tons over the decade between 1996-1997 and 2006-2007 (see Table 7). During this decade total import demand of developed countries is projected to decrease about 5 million metric tons, due to Russia becoming a small net exporter of grain. Over this ten-year period, developing countries are projected to account for all import growth in wheat, with their demand increasing by 25 million metric tons.

If these forecasts are realized, in the year 2006 lower-income developing countries would account for 92 percent of world wheat imports. This has important implications for the factors that will determine importers' sourcing decisions. Research undertaken by the Economic Research Service concluded that developing country importers were largely concerned with price, with credit and quality being similarly weighted secondary factors (Mercier 1993).

In 1996, developing countries accounted for 78 percent of world wheat imports and 75 percent of U.S. wheat exports.

Table 7. Projected Change in Wheat Imports, 1996–1997 to 2006–2007 (million metric tons)

Country	Projected Change	Country	Projected Change
Japan	0.35	Mexico	0.75
Russia	-5.03	Other Latin America	2.22
Other FSU	-0.25	Algeria	2.08
Other Western Europe	0.28	Egypt	3.67
China	3.61	Morocco	1.74
High-income Asia	2.24	Tunisia	0.75
India	4.08	Other Africa and Middle East	0.46
Other Asia	2.55		
Brazil	1.08	Rest of the world	0.09
		Total	20.67

Source: FAPRI

What is noticeable in the quality data is there are no patterns to support the argument that private buyers purchase higher quality wheat than state traders.

However, market sources argue that the demand for quality is increasing rapidly due to increasing sophistication on the part of buyers. The aspects of quality cited of most concern are gluten quality, cleanliness, and uniformity.

One factor argued to be important in increasing the demand for quality is the decline in the role of state agencies as buyers of wheat. An estimated 40 percent of world imports were conducted by state agencies in 1997, a marked decline from the 92 percent of world trade that they conducted in 1973–1977 (Abbott and Young 1997). Wilson (1995) argues that the shift to private buyers has been accompanied by an increase in the demand for quality and in the specificity of the contracts.

Data on the quality of U.S. exports to eight countries is presented (see Table 8). Averages for five quality parameters are presented for when wheat was bought by state agencies and when wheat was bought by private traders in each of the eight countries. Shifts from state to private traders occurred over different time periods in these countries. But what is noticeable in the quality data is there are no patterns to support the argument that private buyers purchase higher quality wheat than state traders.

Montana's Major Wheat Export Markets

Major export markets for wheat produced in Montana include Japan, South Korea, Taiwan, and the Philippines. With the exception of the Philippines, these importers are known to be highly concerned with wheat quality. U.S. market share in these countries for 1987–1996 is shown (see Table 9). Although U.S. market share shows some variability, the data indicate that the United States has been able to maintain a consistent share of markets important to Montana.

Table 8. Import Institution and the Average Quality of U.S. Wheat Imported, Various Years

Country	Institutions	Test Weight	Dockage	Total Defects	Protein	Total Insects
Brazil	State	61.16	0.66	3.99	11.50	7.90
	Private	60.25	0.76	3.65	12.42	3.60
Colombia	State	60.40	0.69	3.39	12.06	7.40
	Private	59.75	0.76	3.59	11.87	6.80
Ghana	State	59.57	0.81	4.36	14.01	8.80
	Private	59.77	0.82	4.03	13.41	2.00
Israel	State	60.67	0.71	3.71	12.06	8.50
	Private	60.16	0.72	4.13	12.27	8.21
Mexico	State	61.00	0.73	3.47	11.81	7.54
	Private	60.00	0.74	3.71	12.54	9.27
Pakistan	State	60.92	0.69	2.20	10.87	4.33
	Private	60.95	0.66	1.98	n/a	7.86
Peru	State	60.83	0.70	3.78	11.78	7.61
	Private	60.81	0.74	3.36	12.04	9.10
Venezuela	State	59.78	0.94	3.72	13.70	9.14
	Private	59.95	0.79	3.79	13.32	3.53

Table 9. U.S. Market Share of Wheat Imports, 1987-1996

	Japan	South Korea	Taiwan	Philippines
	----- <i>percent</i> -----			
1987	59	47	91	91
1988	56	64	92	99
1989	60	87	90	70
1990	57	44	85	91
1991	53	34	99	77
1992	58	35	90	79
1993	57	27	100	86
1994	56	36	93	91
1995	57	56	87	98
1996	54	44	91	94

The shift to higher grades of red wheat is primarily limited to two importing countries, South Korea and Mexico.

Conclusions

The following three conclusions can be reached from the data that is available on the quality of U.S. wheat exports. First, some shift has occurred in the classes of U.S. wheat exported, with a decline in the relative importance of hard red winter concurrent with an increase in the importance of hard red spring. Secondly, there has been an increase in the proportion of total wheat exports that are grade No. 1. However, the shift to higher grades of red wheat is primarily limited to two importing countries, South Korea and Mexico. This does not represent a broad-based shift in demand for higher grades of hard red wheat. Lastly, the data available do not indicate that an increase in the role of private traders in the import market has resulted in an increase in the quality demanded.

As developing countries are likely to be around 90 percent of the world wheat market at the end of the next decade, I argue that price and credit will continue to be of paramount importance. Quality will be the next important factor in determining the source of imports. However, data on U.S. exports do not clearly reveal trends about how other aspects of the quality of U.S. exports have changed. The lack of clear trends makes predictions difficult. This leads me to conclude that if U.S. growers have an incentive to compete on the basis of quality, they will need to pay careful attention to the aspects of quality demanded by individual markets.

Canada and Australia, important U.S. competitors in the wheat market, have wheat boards that are responsible for market evaluation and development. U.S. growers operate in a different environment. However, they can capture many of the important marketing advantages through sufficient investment in organizations that provide market development through long-term relationships, service, and communication of importer preferences.

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Linda M. Young is the Agricultural Policy Coordinator for the Trade Research Center, Montana State University-Bozeman. Her research interests include agricultural policy and trade, emphasizing the grain and livestock markets.