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The Role of Quality in Wheat Import Decisionmaking

Stephanie A. Mercier

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Abstract

The dramatic losses in U.S. wheat market share over the last 10-15 years (a 40-percent decline since 1973) have raised the question of whether additional wheat cleaning would help the competitiveness of U.S. grain. When making decisions about wheat import sources, importers consider factors such as price, wheat quality, trade-servicing reliability, and political relationships. This study focuses on the function of quality in the import decisionmaking process, particularly the cleanliness of wheat. This study finds that wheat quality matters most in markets that do not receive export subsidies or other forms of export assistance, and countries that conduct imports under a state trading system are less likely to be sensitive to quality and more sensitive to price. Offering cleaner wheat to all U.S. wheat export customers would have a net cost of at least $8 million. Delivering a higher quality wheat to select import customers could help maintain market share and even slightly expand share in certain quality-sensitive markets, leading to a net benefit to the U.S. wheat sector of $7-$9 million each year.

Keywords: World wheat trade, grain quality, dockage, import decisionmaking, end-use characteristics, market segmentation

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Foreword

This report is a product of the International Grain Quality Project conducted jointly by the Agricultural and Trade Analysis and Commodity Economics Divisions of the Economic Research Service. This report concentrates on the role of quality in the international wheat market, and subsequent reports will examine the same issue for the world corn and soybean markets.

The main source of information for this report is a series of case studies on the wheat markets and wheat import decisionmaking in 18 countries. The original case studies are available, upon request, from the individual authors. Countries covered and study participants are as follows:

Brazil--Emily A. McClain and Erin M. Dusch
China--Frederick W. Crook, William Lin, and W. Hunter Colby
Egypt--Shahla Shapouri and John Parker
Ghana and Togo--Margaret B. Missiaen and Mark E. Smith
Indonesia--Stephen L. Magiera
Italy--Daniel J. Plunkett
Japan--Lois A. Caplan and Alan J. Webb
Morocco--Karen Z. Ackerman
Pakistan--Rip Landes and Mark Ash
Philippines--Carol E. Levin and Chin-Zen Lin
Russia--Sharon S. Sheffield
South Korea--Terri Raney and Nancy Morgan
Sri Lanka--Rip Landes and Mark Ash
Taiwan--Sophia Wu Huang and William Lin
Tunisia--Rebecca Lent
Venezuela--Parveen Setia and Erin Dusch
Yemen--John Parker and Demcey Johnson

All working papers listed above are available from the Economic Research Service, except for Tunisia, whose author is now with the Department of Commerce.

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Summary

Unless the U.S. wheat sector continues to improve the cleanliness of wheat, the United States may experience a slight decline in its share of the world market over the next few years. The quality of grain is important in the import decisionmaking process in many countries. When making decisions about wheat import sources, importers consider such factors as price, wheat quality, trade-servicing reliability, and political relationships. Wheat quality matters most in markets that do not receive export subsidies or other forms of export assistance, and countries that conduct imports under a state trading system are less likely to be sensitive to quality and more sensitive to price. Delivering a higher quality wheat to select import customers could help maintain market share and even slightly expand share in certain quality-sensitive markets, leading to a net benefit to the U.S. wheat sector of $7-$9 million each year.

The determination of the quality of wheat traded in the world market encompasses both changes in the underlying conditions and policies of the major wheat-exporting countries and the shifting consumption patterns and policy structures in the importing countries. On the export side, climate, production and marketing practices, plant breeding regimes, and government regulations and policies all have the potential to affect the quality of wheat available for export. On the import side, a country's income level and degree of consumer sophistication, domestic production, and extent of government involvement in the importation and distribution of wheat all crucially affect the quality of wheat demanded.

This study examines the market structure and import decisionmaking process in 18 major wheat-importing countries. Of the countries studied, most import a variety of wheat classes, depending on the final products desired by its consumers and on the domestic wheat available to blend with imports. From which country they import their wheat depends on a number of factors, including price, quality, trade-servicing reliability, availability of credit or food aid grants, and intergovernmental relations. Among the 18 countries studied, price was the prime criterion in 8 countries and quality was the first criterion listed in 4 countries, the same frequency as trade-servicing. Quality plays the premier role in import decisionmaking in Italy, South Korea, Venezuela, and Yemen, according to persons in those countries' wheat sectors. Quality appears to be the second- or third-most important factor in 12 other countries.

Within the category of quality factors, gluten quality or protein variability or quantity is the most important factor in 12 countries. Wheat dockage, which is the major focus of this study, was listed as the most important factor in three countries: Ghana, Togo, and Yemen. In general, end-use characteristics (such as gluten, sprout damage, wheat hardness) appeared nearly 50 percent more frequently in the top three factors of a given country than did physical characteristics (such as dockage, test weight, or moisture content).

Dockage content plays only a secondary role within the array of quality characteristics for import decisionmaking in many countries. The exceptions occur because disposal of the material (called screenings) removed during cleaning is costly due to environmental problems or other institutional factors (as in Japan and Taiwan), or because within U.S. competition with Canada, dockage content is seen as the main point of departure (Togo and Ghana). Most millers and end-users regard dockage as

a nuisance that raises shipping and cleaning costs slightly, but of much less importance than other quality factors. In some countries (Indonesia and Sri Lanka), some dockage is welcome because flour prices are state-controlled but millfeed prices are market-driven.

Cleanliness of U.S. wheat seems to have improved over the last few years. This impression is conveyed in the majority of the interviews conducted for this study, and confirmed by statistical analysis of U.S. wheat export data. The cleaner wheat likely results from both procedural changes in the grading and loading of U.S. wheat and from tighter contract specifications. The major competition for U.S. wheat trade in terms of quality comes from Canada and Australia. Their wheat quality is regarded by most foreign buyers as superior to U.S. wheat quality in terms of quality variability and cleanliness. Dockage in U.S. wheat tends to be higher than in Canadian and Australian wheat. Argentine and European Community (EC) wheat quality, in contrast, is regarded to be inferior to U.S. wheat. At present, Canada and Australia are holding on to their historical markets and are receiving price premiums for their wheat in many of them.

Offering cleaner wheat to all U.S. wheat export customers would have a net cost of $8-$26 million (depending on locus of cleaning), but exporting such wheat only to quality-conscious markets could reap benefits.

The Role of Quality in Wheat Import Decisionmaking

Stephanie A. Mercier

Introduction

This study examines whether additional wheat cleaning would address an aspect of the competitiveness of U.S. grain often raised by market observers. This study attempts to gauge whether cleaner wheat would increase export receipts enough to offset higher cleaning costs. Broader quality concerns expressed by wheat importers are assessed by focusing on importers' choice of exporters, including the influence of a wide range of factors, one of which is cleanliness. This study also examines the notion that any gains from providing cleaner wheat would be transitory, and eventually be bid away by competing exporters (though likely at some cost to them). These concerns are addressed by looking at potential responses from U.S. competitors, making the market picture somewhat interactive.

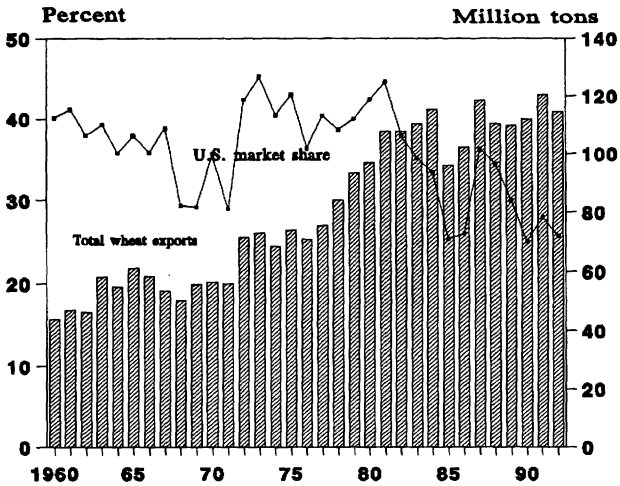
Title XX of the Food, Agriculture, Conservation, and Trade Act of 1990 outlines the steps that the U.S. Department of Agriculture (USDA) should take to determine if "establishing or amending the standards would...enhance the competitiveness of exports of wheat, corn, barley, sorghum, and soybeans from the United States." The title also instructs the administrator of the Federal Grain Inspection Service (FGIS) to revise and if necessary establish standards that include "economically and commercially practical levels of cleanliness" if, among other things, it is shown that the benefits outweigh the costs of imposing such standards.

Background

The U.S. wheat sector has faced intense competition over the last several years in the world market. What factors are causing some wheat importers to choose Canadian, Australian, Argentine, or French wheat over U.S. wheat, such that the U.S. share of the world wheat market has fallen from a 1973 peak of 45 percent to just under 30 percent in the early 1990's (fig. 1)? There are several possibilities: other wheat exporters may consistently offer more favorable prices (including subsidies) or credit terms, the shift in purchasing patterns might arise from perceived or actual differences in product quality between the various export sources, or bilateral relationships could be influencing purchasing patterns.

Given the variety of countries that commonly import wheat (at least 100 countries imported some wheat or wheat flour in 1991), it is likely that some combination of all of these factors is important. Some studies suggest that quality is an important determinant of the sourcing decision for wheat imports (U.S. Congress, Office of

Figure 1
U.S. share of world wheat exports



Source: USDA/FAS, Dec. 1992(b).

Table 1--Major wheat quality characteristics[1]

Physical	Wholesomeness	Intrinsic
Heat-damaged kernels	Live insects	Protein quality
	Insect damage	Protein quantity
Nonmillables:	Noxious weed seeds	*Gluten* quality
Dockage	Pesticide residues	Wheat hardness
Foreign material		*Sprout damage*
Other wheat classes		Kernel size
Shrunken and broken kernels		Color
Moisture content		
Test weight		
Total defects		

[1]For key end-use tests (such as *alveographs, dough tests, and farinographs*) that apply to certain intrinsic characteristics, see glossary.

Technology Assessment (OTA), 1989);[1] the presence of excessive nonwheat material is frequently the source of complaints lodged by foreign buyers (Hill, 1990), although such complaints have lessened in recent years.[2]

But while the congressional mandate focuses the quality issue very narrowly on the lack of wheat cleanliness, others in the industry see the quality problem more broadly, encompassing perceived deficiencies in end-use characteristics (such as are shown in table 1) and uniformity between and within shipments. This study attempts to provide an assessment of the factors determining wheat purchasing by foreign buyers, particularly the role that grain cleanliness (generally defined as *dockage* and *foreign material*) plays in the import decisionmaking process (reducing the amount of dockage in export wheat would also tend to reduce problems with pesticide residues, insect damage, and noxious weed seeds).[3] Wheat quality is a multidimensional issue, but dockage is a factor that is easily measured and for which there are known technical solutions, but no consensus exists within the wheat industry as to how best to deal with it. In part, this study provides information to the industry in order to resolve this issue.

This study complements a report on wheat cleaning from a domestic perspective, *Economic Implications of Cleaning Wheat in the United States* (Hyberg and others, 1993). The companion study evaluates the costs of cleaning U.S. wheat to meet tight dockage standards; it also evaluates the domestic benefits likely from low-dockage wheat. The domestic study concludes that cleaning U.S. wheat to levels comparable with Canadian and Australian wheat (0.1-0.4 percent) is not economically feasible unless market premiums or discounts for dockage and foreign material become much higher or benefits from any increase in trade offset the additional net cost of cleaning. U.S. millers typically do not offer premiums for low-dockage wheat because they clean all wheat to minimal levels of dockage (under 0.1 percent) before milling. While most foreign millers have

[1]Names in parentheses refer to sources listed in the References at the end of the report.

[2]The reduction in the number of complaints does not necessarily indicate a reduction in the amount of dockage in wheat exported. It may reflect a certain frustration on the part of importers due to the lack of an appeal or arbitration mechanism in the U.S. export system to deal with such complaints. Many importers suggested that they no longer file complaints about U.S. grain exports because they have received no action on them in the past.

[3]Italicized words are defined in the glossary.

cleaning equipment as well, they also have to bear the burden of ocean transport costs for dockage and the risk of receiving higher levels of dockage than reported if they purchase sublots. The costs incurred from cleaning all export wheat within the marketing system annually exceed the domestic benefits (such as transportation savings, *screenings* resale, etc.) by at least $23 million.[4] Hence, in order to offset the higher costs associated with the tighter cleanliness standards, cleaner U.S. wheat would have to generate more exports or a higher export price.

Methodology

The unusual nature of this study dictated the use of a number of approaches in conducting it. The variety and number of importers studied complicated the data- and information-gathering process. The direct approach adopted in the companion domestic study consisted of a thorough examination of all levels of the U.S. wheat marketing chain and scientific examinations of the costs of cleaning wheat. This strategy was quite straightforward and provided a wealth of information, but could not be duplicated in the international study because there is no parallel structure of producer and trade organizations in the international market that would have facilitated the use of indepth surveys at reasonable cost. Instead, for this study, we used a series of country case studies as the foundation of our work, examining the market structures and import decisionmaking process of key wheat-importing countries. We sought to discern the role of wheat quality in that framework, and place quality in the context of a differentiated world wheat market. These studies were combined with earlier theoretical and empirical work. In addition, wheat quality data collected both within and outside the country studies were examined to provide more detailed information for the market structure and export strategies revealed in this study.

Brief Description of Study

The following section, "The World Wheat Market," initially describes the world market setting. It briefly discusses the institutions, programs, and regulations in wheat sectors that affect the quality of wheat available for export. This section highlights the relevant features affecting quality in the U.S. wheat sector and those of other major exporters: the European Community (EC), Canada, Australia, and Argentina. Extensive use is made of the survey information collected by the Office of Technology Assessment in 1989.

Table 2--Countries featured in individual case studies

Country	Description
Brazil	MI, LA
China	LI, ASIA
Egypt	LI, ME
Ghana	LI, AFR
Indonesia	LI, ASIA
Italy	HI, EU
Japan	HI, ASIA
Morocco	LI, AFR
Pakistan	LI, ASIA
Philippines	LI, ASIA
Russia	L-MI, ASIA-EU
South Korea	HI, ASIA
Sri Lanka	LI, ASIA
Taiwan	HI, ASIA
Togo	LI, AFR
Tunisia	MI, AFR
Venezuela	MI, LA
Yemen	LI, ME

Key: LI=low-income, MI=middle-income, HI=high-income, LA=Latin America, EU=Europe, ME=Middle-East, AFR=Africa.

The foundation of this study, the section on "Importers and Import Decisionmaking," is a series of individual case studies conducted for 18 countries that currently import U.S. wheat (table 2). The countries were selected to represent a cross-section of major importers of wheat, so as to be able to characterize importer behavior across the world market. These studies consist of background material gathered on the wheat market in each country; this material is combined with the results of personal interviews (conducted by analysts primarily from the Economic Research Service (ERS)) of millers, bakers, processors, traders, trade association officials, and government officials involved in each country's wheat sector. This section draws heavily on both qualitative and quantitative information gathered in these separate country studies, as well as on previous research in this area. The country material is organized on a regional or income-level basis. China and Russia receive separate treatment

[4]The domestic study found that the net cost of cleaning all export wheat in a given year would range from $41 million at country elevators to $23 million at *subterminal elevators* for winter wheats and country elevators for spring wheats.

because of their large volume of imports and unique market characteristics. The examination of major importers' responses is organized around a two-stage wheat purchasing procedure (similar to a standard budgeting process): the first step focuses on how a country's total import wheat needs are established and what general role quality plays, and the second stage examines how the country sources its imports.

The section on "Comparison of U.S. Wheat Performance and Importers' Needs" addresses the aggregate effects uncovered in the study (both within the country case studies and from outside data) and their implications for the U.S. market. It includes aggregate analysis of export data acquired from FGIS and comparison with quality data available from other major wheat-exporting countries. Potential responses to U.S. moves toward higher quality on the part of competitors and the nature of wheat market segregation and competition are examined, and the effect on U.S. export demand for wheat is evaluated.

The World Wheat Market

The world wheat market is a complicated mechanism, one that enables communication of demand from buyers to sellers for a product that is both a food staple and a key livestock feed ingredient in many countries. The market is characterized by a heavy concentration of market share among a few exporters and a large number and wide variety of importers, although in volume terms, imports are dominated by a handful of countries. Nearly one-fifth of the world's wheat production is traded on the world market. Wheat trade is extensive because of the variety of end-uses demanded by the world's consumers and because of the frequent fluctuation in production in any one region due to weather. This trade is not homogeneous but consists of distinct classes of wheat, which overlap slightly in terms of end-uses.

The staple nature of wheat consumption in many countries has spurred the use of government programs to protect both domestic consumption and domestic production from variability in world prices. Because of the fierce competition among the major exporters for market share, world wheat trade is dominated by the heavy use of government-financed subsidy programs. Markets that account for more than 70 percent of the world's wheat imports are assisted by one or more export programs, including export subsidies (such as the Export Enhancement Program (EEP)), food aid, export credit, or other types of market promotion (U.S. Department of Agriculture, Foreign Agricultural Service, (FAS), Dec. 1992 (b), and Wilson, Scherping, and Johnson, 1992). The world wheat market can be segmented both on the basis of different end-use demands and on the use of export programs that alter the transmission of world price changes into those markets.

Major Wheat Exporters

Over the last 5 years, five major exporters have accounted for 90 percent of the world wheat trade (in order of market share): the United States, the European Community (EC) (with France as the single biggest exporter), Canada, Australia, and Argentina (table 3). These countries represent different sets of attitudes toward maintaining quality in export wheat. The remainder of the export market is held by several countries (in order of 1990-92 market share), including Turkey, Saudi Arabia, Hungary, Sweden, Austria, India, and Yugoslavia. In this latter group, all except Turkey and Saudi Arabia are intermittent exporters.

The production of wheat by the major exporters is primarily directed toward the export market, though the focus varies somewhat between the major players. Between 1987-91, the share of annual production exported ranged from 24 percent for the EC to 80 percent for Australia. The ratio of exports to total production was nearly 60 percent for France, much higher than for the entire EC (appendix table 3). This export level and the strategy each country adopts in marketing export wheat both play crucial roles in the tradeoff at the farm level between the emphasis of yield or the emphasis of quality.[5] Most of these countries also utilize export programs that act to segment the world wheat market by cushioning some importers from changes in prevailing market conditions.

Quality is used as a marketing tool in several cases (especially Canada and Australia). In these countries, the grain production and marketing system emphasizes quality over yield at the farm level and quality rather than volume in the *marketing channels*. In other countries, many

[5]A study for hard red spring wheat grown in North Dakota (1981-85) showed that a 10-percent increase in average yield would cost from 0.6 to 1.4 percent in average protein content (U.S. Congress, 1989).

Table 3--Exports and production of major wheat exporters[1]

Country	1988	1989	1990	1991	1992	5-year market share
	Million tons					*Percent*
Exports:						
United States	37.6	33.5	28.3	35.1	35.5	34.0
EC[2]	20.6	21.3	20.7	21.0	22.0	21.1
Canada	13.5	17.0	20.5	24.2	22.5	19.5
Australia	10.7	10.8	11.8	8.2	9.7	10.2
Argentina	3.5	5.6	4.8	5.5	4.6	4.8
Total	85.9	88.2	86.1	94.0	94.3	89.6
World	97.9	97.0	94.5	108.2	102.7	---
	1988	1989	1990	1991	1992	Share of production exported
	Million tons					*Percent*
Production:						
United States	49.3	55.4	74.5	53.9	66.9	56.7
EC	78.4	82.0	84.7	90.0	84.4	25.1
Canada	15.9	24.8	32.1	31.9	29.9	72.4
Australia	14.1	14.2	15.1	10.7	14.0	74.9
Argentina	8.4	10.2	10.9	9.8	8.5	50.2
Total	166.1	186.6	217.3	196.3	203.7	46.2
World	495.0	532.9	588.1	542.2	555.2	18.4

[1]Reflects marketing year. [2]Intra-EC trade excluded. See appendix table 3 for breakdown by EC member. Source: USDA/FAS, Dec. 1992 (b).

producer support programs are volume-oriented and encourage farmers to achieve gains in yield at the cost of quality attributes. These program strategies are discussed as well as other exporter programs that affect the import decisionmaking process. The effect of wheat quality, including cleanliness, on U.S. exports depends both on the quality of competitors' wheat and importers' preferences. More discussion of these wheat sectors is found in appendix A.

The diversity of U.S. wheat classes potentially affects the uniformity of U.S. wheat exports. Most other major wheat exporters produce one dominant wheat class (although nearly all grow at least minor amounts of durum wheat). The United States, on the other hand, produces four major wheat classes as well as durum wheat (see table 4). Many States produce multiple varieties within wheat classes, and that wheat moves through grain facilities mixing varieties and increasing quality variability.

The production of so many classes of wheat and so many varieties within classes results from the geographic and climatic diversity of the United States as well as the lack of government regulation in these matters. The ability to offer so many classes of wheat lends U.S. exporters an advantage in being able to serve so many types of markets. However, the large number of varieties within each class facing different growing conditions in the United States creates a disadvantage by contributing to

Table 4--Primary export wheat classes

Class	Abbreviation
U.S. hard red spring[1]	HRS
U.S. hard red winter	HRW
U.S. soft red winter	SRW
U.S. white wheat	WW
U.S. hard amber durum	HAD
Canadian western red spring	CWRS
Canadian western amber durum	CWAD
Australian hard	AH
Australian standard white	ASW
Australian prime hard	APH
French common wheat	Frn.
Argentine trigo pan	ARGT

[1]Some shipments of HRS are sold as dark northern spring (DNS) or northern spring (NS), subclasses of HRS.

greater variability in wheat quality. This factor is magnified by the distance the wheat moves from farms to *export elevators* and the consequent opportunity for wheat to be commingled with same-class wheat from other areas that may have different intrinsic attributes.[6] The gains from choices in wheat classes and the problems from commingling in the U.S. marketing system tend to offset each other.

In addition to a more export-focused market structure, other major wheat exporters (particularly Canada and Australia) have adopted several strategies to reduce quality variability in exported grain. These strategies include: (1) setting grain standards so as to require wheat to be cleaned at either inland or export elevators, (2) controlling grain variety release, (3) insisting on *identity preservation*, or (4) any combination of the above (U.S. Congress, 1989).

Most competitors have extensive cleaning facilities available, either at the country elevator level or at *terminal markets*. In Canada and Argentina, any necessary cleaning to reach export standards is done at export facilities, although in the case of Argentina, some quality restrictions were loosened when state trading was abolished in 1991. In France and Australia, cleaning is widely available at the local level, although used less stringently in France. In fact, in Australia, wheat must be cleaned on the farm or commercially to meet Australian Wheat Board (AWB) standards before delivery to the state-licensed Bulk Handling Authorities. On the other hand, evidence from our domestic grain-cleaning study suggests that U.S. elevators lack cleaning equipment except in limited geographical regions (such as North Dakota). Because other countries, particularly Canada and Australia, mandate grain cleaning before export, cleanliness is not usually a concern for importers.

Wheat exporters from most countries competing with the United States exercise varying degrees of regulatory control over plant variety release. Varieties must be submitted to one or more government agencies and must meet or exceed certain agronomic and end-use criteria and/or be visually distinguishable from established varieties for approval. In Canada, unlicensed varieties are not accepted for export by the Canadian Wheat Board (CWB), and must be sold for feed. The insistence on variety limitations has cost producers in those countries some lost production in terms of lower yields (Carter and others, 1986). Historical data show that countries with such regulations (particularly stringent in Canada and Australia) have had lower yields and less growth in yields over the last few decades than U.S. producers. Some of the yield differential between U.S. wheat and Canadian and Australian wheat may be attributable to less favorable climatic conditions and growing primarily high-protein hard wheat varieties, but it is likely that Canadian and Australian yields would improve if their farmers were permitted to adopt new varieties more freely.

One of the consequences of strict variety control and a uniform growing environment is the ability to enhance and preserve important end-use characteristics through the market channel. The identity preservation that occurs in the U.S. system is limited to class and grade, and the latter is a result of the final *blending* process. A system's proficiency in achieving identity preservation for grain is probably a function of several factors: (1) the speed at which grain moves through the marketing channels (all grains, not just wheat), (2) the storage capacity relative to grain volume at the various levels in the marketing chain, (3) the availability of testing equipment at the receiving point, and, as discussed above, (4) the distribution of distinct grain varieties (Hunter and Hooper, 1992).

The Wheat Boards in Canada and Australia control market promotion, export contracting, and customer servicing

[6]For example, over a 4-year period (1986-89), U.S. No. 1 hard red spring wheat grown in North Dakota had a protein content standard deviation of a full percentage point a year (USDA/FGIS, 1986-89).

within a single agency, while the private sector in the United States handles these tasks. This distinction allows the Canadian and Australian systems to respond to customer complaints about quality or other delivery problems, while the United States has no central mechanism to deal with such problems. U.S. export programs have instead concentrated almost exclusively on subsidizing the price of wheat to U.S. export customers.

In one particular area, the provision of uniform grades and standards, the United States has the reputation of providing accurate and reliable information to importers to the extent permitted by the grades. In fact, in many commodities traded, U.S. grades serve as the benchmark for contracts made throughout the world. Among major exporters, only the United States separates nonmillable material within wheat into two categories, dockage and foreign material. Canadian export standards require dockage to be cleaned out before the wheat can be exported. The lack of a consistent definition among export sources for these substances sometimes creates problems. Many sophisticated importers believe that U.S. grades concentrate too much on physical attributes and fail to create a sharp-enough distinction between grades to be useful for their purposes. Other exporting countries, particularly those in the EC, are leery of adopting similar standards (other than those within the intervention system) because they regard them as too inflexible.

The U.S. grain marketing system appears to be at somewhat of a disadvantage with respect to the marketing systems of competitors, Canada and Australia in particular, in terms of preserving a uniform quality of grain for importers. Those two countries have made a deliberate decision to trade flexibility in their wheat marketing system for assuring a uniform quality. This lack of flexibility does not impede them much because their wheat export capacity is considerably lower than U.S. wheat export capacity. The dilemma facing the United States in seeking to improve the quality of wheat it delivers is how to maintain flexibility in its system while still responding to demands for high-quality wheat when it occurs.

Importers and Import Decisionmaking

A description of the role of wheat quality in the world market is incomplete without considering how importers value and select among wheat qualities offered. Quality, among the various factors considered, is important when importers decide on the source of their wheat purchases. Wheat importers are even more heterogeneous than wheat exporters, and this diversity among end-users suggests a range of responses to a change in the dockage level of U.S. wheat available for export.

Importer Case Study Procedures

A series of country case studies was conducted for major importers of U.S. wheat between April and September 1992 (summary in table 5). Eighteen countries were selected to represent diversity with regard to income level, location, and marketing systems among wheat importers. These 18 typically account for about 70 percent of all U.S. wheat exports, and about the same percentage of global wheat imports. Thus, an examination of market structures and buying practices should reveal how the world market might respond to changing prices and qualities.

A major component of each country case study was drawn from a series of interviews conducted in-country by a team of ERS analysts. To identify information gaps, each team summarized existing primary and secondary source material prior to departure. Guidelines and materials for interviews were also formulated with the help of U.S. grain trade experts and U.S. Embassy and trade association officials. The interviews were designed to explore the respondents' roles in the import decisionmaking process, the key factors entering that decisionmaking process, and their view of the relative worth of U.S. wheat with respect to the desired set of end-products. The importance of dockage was examined within the matrix of decision criteria and potential quality factors. A summary of results is shown in table 6.

One key finding of this study is that a country's sensitivity to quality as an import decisionmaking issue is strongly related to the type of marketing system it possesses. The two major types of systems among major wheat importers are state trading and private trading. In many low-income countries dominated by state trading, imported wheat is allocated by the trading agency to its various uses, and those end-users have little or no voice in deciding the quality specifications of the wheat they receive (fig. 2). Flour or bread is usually sold below world price levels in order to subsidize its consumption. A few of these countries use private traders as intermediaries. Trading agency officials frequently consider acquiring maximum wheat volume at low cost the key objective in the

Table 5--Summary of national wheat sectors studied[1]

Country	Respondents interviewed	Interviews represent percent of import market	Per capita consumption[2]	Domestic production	Trade/domestic policies	Total imports
	Respondents	*Percent*	*Kilograms*	*Million tons*	*Policies*	*Million tons*
Brazil	13 mills 3 associations: 1 national 2 regional 1 baker Numerous government officials	50	50	3.2	Private traders, governmental buffer stocks	4.7
China	6 officials 8 mills 14 others including inspection agencies	100	90	96.0	State trader: *CEROILS*	15.5
Egypt	3 officials	100	155	4.5	Dominated by state trader; some private trade	6.2
Ghana	4 mills 1 trader 3 bakers 1 wholesaler	100	7	0	State trader	.2
Indonesia	2 millers 2 bakers 1 distribution association 1 trader 1 government official	100	10	0	State trader	2.3

See footnotes at end of table.

Continued--

Table 5--Summary of national wheat sectors studied[1]--Continued

Country	Respondents interviewed	Interviews represent percent of import market	Per capita consumption[2]	Domestic production	Trade/domestic policies	Total imports
	Respondents	*Percent*	*Kilograms*	*Million tons*	*Policies*	*Million tons*
Italy	6 mills 4 traders 3 associations 1 pasta maker	Mills--49 Traders--64 Pasta--24 (Percent of non-EC trade)	139	8.0 (1989-91 average)	Private traders	0.7 (non-EC)
Japan	1 agency official 4 mills 1 association 1 trader	95	35	.9 (1989-91 average)	State trader; price support system	5.7
Morocco	2 government officials 3 milling association members 1 mill 2 private importers	100	154 (nondurum wheat)	3.8 (1986-91 average)	State trader; price support system	1.6 (1986-91 average)
Pakistan	6 officials 5 mills 3 private traders 1 baker	100[3]	140[4]	13.0	State trader; private imports only small fraction	1.6 (1989-91 average)
Philippines	12 mills	100	24	0	Private traders 10% value-added tariff (1990/91 marketing year)	1.6 (1990-91 average)
Russia	3 millers 1 government official 1 state trader	3	96 (1986-90 average)	43.5	State trader	10.6

See footnotes at end of table.

Continued--

Table 5--Summary of national wheat sectors studied[1]--Continued

Country	Respondents interviewed	Interviews represent percent of import market	Per capita consumption[2]	Domestic production	Trade/domestic policies	Total imports
	Respondents	*Percent*	*Kilograms*	*Million tons*	*Policies*	*Million tons*
South Korea	3 mills 1 association 1 cooperative that buys for small mills	85	36	[5]	Private traders	4.1
Sri Lanka	5 officials 1 mill (3 officials) 1 baker 1 trader	100	39 (1989-91)	0	State trader	.7 (1989-91 average)
Taiwan	5 millers	17	40 (1986-90 average)	[5]	Private monopoly trade; Government restricts imports to registered mills	.7 (1990)
Togo	1 miller 2 bakers	100	15	0	Private sector monopoly	.1
Tunisia	9 millers 1 trader 1 official	Unknown	93/common 83/durum	1.2[6]	State trader	.6 (1992 estimate)
Venezuela	4 millers 1 association official	67	56	[5]	Private traders	1.1
Yemen	1 miller 8 traders	97	147	.1	Private trading with governmental intervention	1.8 (1992)

[1]Data from 1991 marketing year unless otherwise indicated. [2]Consumption figures are flour equivalents, assuming a 75-percent extraction rate for flour from wheat. [3]Accounted for government officials who import nearly all wheat, but millers interviewed milled only small share of market. [4]Per capita wheat consumption for Pakistan not broken down into wheat food use versus other uses. [5]Less than 10,000 tons but more than zero. [6]Tunisian production split between 270,000 tons durum and 880,000 tons common (nondurum) wheat.

Table 6--Summary of country interview results[1]

Country	Market shares	Class breakdown	Sourcing factors	Quality factors
Brazil	Argentina 50% Canada 30% United States 14% Other 6%	Hard winter 47% Durum 24% Soft winter 17% Spring 12%	Price Quality Credit Trade-servicing	Gluten quality Protein quantity Impurities Color
China	Argentina 10% EC 10% Australia 20% Canada 30-40% United States 40-45%	Spring 37% Hard winter 31% Soft winter 32%	Price Quality Government trade relationships	*TCK smut*/Johnsongrass seed/ live insects Pesticide residues Dockage/protein quantity
Egypt	Australia 28% Canada 7% EC 7% Saudi Arabia 7% United States 58%	ASW U.S.: White, HRW, NS	Price Credit Quality	Cleanliness Live/dead insects Foreign material Test weight Dockage
Ghana	Canada 50% United States 50%	Spring 100%	Trade-servicing/ relationships Quality Price	Dockage Moisture Protein content
Indonesia	Argentina 13% Australia 45% Canada 12% United States 12%	Hard 60% Soft 40%	Price Quality Company/agency relationship	Protein Foreign material Shrunkens/brokens Test weight
Italy	EC 88% United States 7% Canada 5%	HRS, HAD CWRS, CWAD[2]	Quality Price Trade-servicing	Gluten quality Protein quantity Stability Cleanliness Shrunkens/brokens Color (durum)

See footnotes at end of table.

Continued--

Table 6--Summary of country interview results[1]--Continued

Country	Market shares	Class breakdown	Sourcing factors	Quality factors
Japan	United States 56% Canada 25% Australia 19% (1989-91 average)	Hard spring 46% Hard winter 37%[2] White 14% Durum 2%	Trade relationship End-use requirements Reliable supplier Quality	High protein in WW Low protein in DNS Quality variability Dockage Chemical residue
Morocco	France 40% United States 33% Other EC 27% (1990)	U.S.: SRW 73% HRW 23% HRS 4%	Price Credit Quality Government/trade relations	Test weight Dockage Protein quantity Moisture
Pakistan	Australia 16% United States 70% Others 14%	Soft white 75% Hard white 20% Hard red 5%	Private importers: Price Rapid delivery Quality Government importers: Credit/grants Price Minimum quality specs Ability to meet delivery	Moisture Gluten quality/ wheat hardness Color
Philippines	Canada 15% United States 85% (1990)	Hard 75% Soft 25%	Price Quality	Protein quantity Gluten quantity/ test weight Kernel size/ *falling number*
Russia	Canada 23% EC 26% Hungary 6% United States 35% (1988-90 average)	HRW 75% HRS 20% SRW 5%	Credit Price Quality	Gluten content Moisture Wheat hardness Nonmillable material

See footnotes at end of table.

Continued--

Table 6--Summary of country interview results[1]--Continued

Country	Market shares	Class breakdown	Sourcing factors	Quality factors
South Korea	Australia 18%[3] Canada 2% United States 80%	Australian: AH 11%, Soft 32%, ASW 57% Canadian: CWRS 80% U.S.: WW 48%, HRW 30%, HRS 22%	Quality Price Credit Trade-servicing	Protein/gluten Sprout damage *Amylograph*
Sri Lanka	United States 88% (1990)	HRW/DNS 50% SW/SRW 50%	Grants Bilateral trade relations Price Credit Minimum quality specifications	Protein quantity Moisture Test weight
Taiwan	United States 88% Canada 10% (1988-90 average)	HRS 42% HRW 39% SRW/WW 19%	Government trade relationships Quality Price	Gluten quality Moisture Protein quantity Dockage
Togo	Canada 15% EC 15% United States 70%	Soft red 20% HRS/CWRS 80%	Trade service/ relationships Price Quality	Dockage Moisture Protein quantity
Tunisia	Canada 3% EC 34% United States 57% Others 3%	U.S.: Durum 38% SRW 38% HRW 15% HRS 8%	Price	Protein level Moisture Dough elasticity (W)
Venezuela	Canada 66% United States 34%	Durum 20% Spring 70% Other 7-10%	Quality Price Trade-servicing	Gluten quality Protein quantity Sprout damage Dockage Test weight
Yemen	United States 35% Australia 27% EC 12%	White 48% Hard winter 44% Spring 8%	Price (EEP) Credit Quality Trade-servicing	Dockage Gluten quality Test weight Moisture

/ Factors tied in rankings. [1]All figures are for 1991 marketing year, unless otherwise noted. [2]Hard winter includes all Australian wheat imports for Japan, consisting of both APH and ASW. [3]South Korean market share excludes 2 million tons of wheat imports for feed use.

Figure 2
Wheat flow in state-trading importers

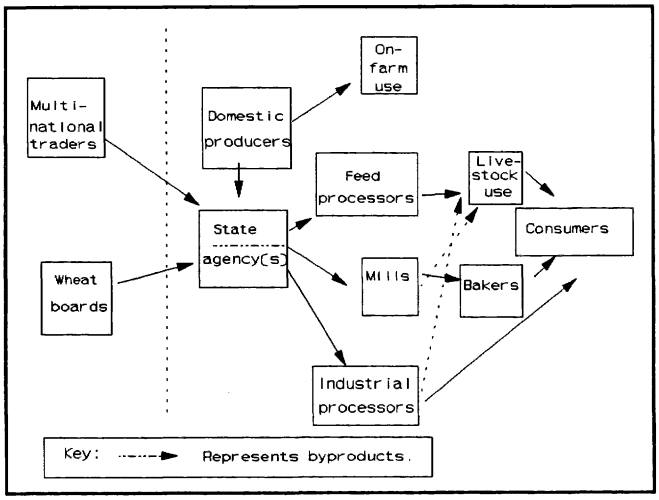
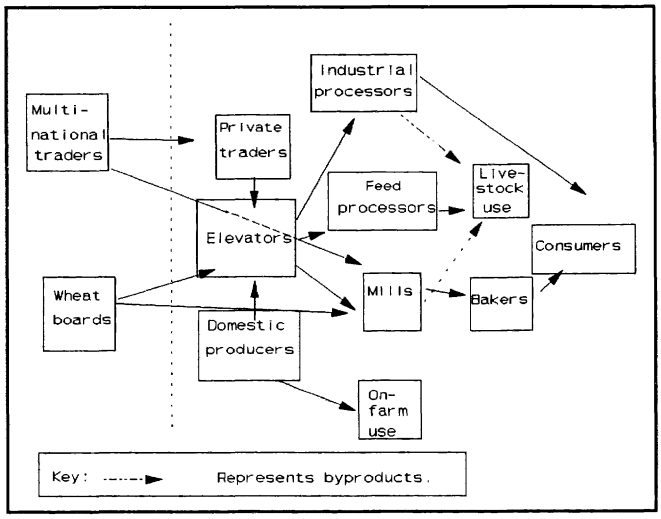


Figure 3
Wheat flow in importing country with private trading



decisionmaking process, and access to supplier subsidies or credit programs is crucial to attaining this objective.

In countries where imports are privately conducted, private, multinational traders, or large-scale mills purchase wheat from exporters (private firms or national boards) and re-sell it on a profitmaking basis to the various end-users (fig. 3). Examples discussed later include Italy, Venezuela, and the Philippines. All players in such free markets seem to have a chance to influence contract specifications, including quality, although the more concentrated the processing industries are, the more directly they influence the importing decisions. Importers also have the capability of imposing general or targeted tariffs (such as Brazil or Venezuela) to encourage bilateral relationships or discourage dumping by exporters.

On the exporting side, those countries that operate through a state marketing board appear to be more responsive to unusual quality specifications and complaints on quality than are countries that export through private firms. Marketing boards tend to exercise control over quality throughout the marketing system and are in better positions to meet exact end-use needs.

Major wheat exporters, particularly those with national boards, tend to negotiate long-term, bilateral agreements with selected large importers, in order to give some structure to their future sales. In the face of tight supplies, some countries must limit their sales elsewhere in order to meet those obligations. Importers who typically buy from those countries but have no agreements must then scramble to fill their import requirements. Pakistan's and Indonesia's imports of Canadian wheat fell in 1988 because of the Canadian drought, as neither country has a formal agreement with the CWB. Each country had to increase its imports from other sources in 1988 (more Australian wheat for Indonesia, more U.S. wheat for Pakistan) (Harwood and Bailey, 1990).

Quality Comparisons and Price Relationships by Major Importers

Although quality and price are examined as separate factors in the matrix of import decisionmaking criteria in this study, the perceived quality of the wheat to be imported and the price importers are willing to pay often have a strong positive relationship. Many buyers with financial constraints treat price and quality as a tradeoff; they will accept slightly lower quality, if they are receiving a good price. Importers frequently maintain a similar purchasing pattern over the years as long as their expectations on quality are met. If those expectations are not met, market share shifts toward those exporters with reputations for delivering consistent quality.

Aggregate Quality Comparisons

Most of the quality data collected during the course of the country case studies that dealt with cross-exporter comparisons focused primarily on the issue of dockage, since cleanliness is singled out in the congressional mandate for this research. The hypothesis that U.S. cleanliness lags other countries was widely supported in the interviews; we found that both Canada and Australia are viewed as performing better than the United States in terms of delivering low-dockage wheat. In cases where quantitative data were provided (including China, Japan, the Philippines, Russia, South Korea, Sri Lanka, Taiwan, and Ghana), U.S. wheat had two to three times more dockage (or nonmillable material) than its most cleanliness-conscious competitor, usually Canada or Australia (table 7). However, in nearly all cases studied, U.S. wheat was reported to have lower dockage levels than EC wheat. Most respondents conceded that the dockage content of U.S. wheat has been declining over the last few years, a contention supported by analysis of FGIS export quality data.

Among the quality factors included in discussions, phytosanitary considerations, such as pesticide residue and live insects, were mentioned in several cases, but explicitly entered the rankings in only three countries: China, where such things as Telletia Controversa Kühn (TCK) smut, Johnsongrass seed, live insects, and pesticide residue all ranked high, Egypt, where the presence of live insects was the second most important quality concern, and Japan, where the presence of pesticide residues ranked fifth in importance. A few countries monitor insect infestation levels but do not currently see it as a problem, while U.S. wheat shipped to Sri Lanka and Russia is typically fumigated (on board ship for Russia, at unloading for Sri Lanka). No respondent mentioned rejected shipments for phytosanitary reasons, but some classes of wheat or particular production regions are avoided because of past problems.

In terms of overall quality (including both physical and intrinsic characteristics), the United States was also usually ranked behind Canada and Australia by interview participants. These rankings may be distorted in some countries when lower protein U.S. wheats (like SRW or HRW) are compared with high-protein competing wheats (like CWRS). Many of the comparisons between wheats were related to protein (or gluten). Problems with gluten quality in HRS relative to CWRS were primarily limited to those markets serviced out of the Gulf of Mexico or Great Lake ports, usually wheat grown in Minnesota. End-users of HRS in other countries regard its gluten quality to be comparable with or superior to CWRS, but some have concerns with variability (both within and between shiploads) in protein quantity. Protein variability also appears to be a problem with white wheat grown in the U.S. Pacific Northwest. Only when U.S. wheat is competing directly with EC or Argentine wheat does it usually prevail in overall quality rankings.

Aggregate Price Relationships

Prices paid for imported wheat differ considerably between customers, reflecting incidence of export subsidies, export credits, and aggressive marketing strategies, as well as differing wheat quality. For example, within a particular wheat market segment, No. 1 CWRS, (13.5 percent protein, Thunder Bay) often receives a substantial premium (ranging from $4/ton to $18/ton) over No. 2 HRS or DNS (14 percent protein, Minneapolis), but No. 2 CWRS does not (although in some markets CWRS sold as No. 2 resembles No. 1 in quality). In a few markets in which Canada has been actively attempting to capture market share (for example, the Philippines, South Korea, and Venezuela), the CWB has been selling CWRS at a discount to U.S. DNS. In limited markets (like Taiwan), U.S. No. 1 DNS is priced more closely to No. 1 CWRS. CWAD gets a higher price than U.S. HAD in high- and middle-income markets (such as Italy), because its quality is more consistent, but some low-income durum customers (like Tunisia) compare U.S. durum's costs and quality with EC durum and tend to not buy CWAD because they are seeking the lowest price. U.S. HRW, which is the largest U.S. wheat class, is usually priced to compete with the dominant wheat provided by rival exporters in a given market (in order to capture market share), even if HRW has higher protein content. This appears to be the case in Japan, South Korea, and Taiwan.

Among classes of U.S. wheat sold for export, white wheat receives a premium over HRW and sometimes even HRS (as in South Korea and Taiwan, which prize white kernels and need intrinsic qualities suited to noodles, flat bread, and other unleavened goods found more often in low-protein wheat). This aspect is also true for Australian wheat in the Middle East. This relationship was supported in a study by Veeman (1987). The end-use values for wheat are thus not necessarily directly related to protein content, although it is an important factor.

Each subsection within this portion of the report consists of three major parts: (1) the major players in each

Table 7--Summary of key price and quality results

Country	Sample price relationships[1]					Average dockage	Anticipated change in U.S. imports from low-dockage wheat	Expected premium from low-dockage wheat
	Year/basis	----------*Dollars per ton*----------				*Percent*		
Brazil		Arg.[2]	Can.	U.S./HRW		U.S. 1.6	Share would improve; project 15-percent increase	Proportional to dockage change
	1991/*f.o.b.*	110.00	94.50	94.50		Arg. 1.0		
	1992/f.o.b.	113.50	145.00	154.60		Dom. .5		
	1992/*c.i.f.*	206.25	270.00	265.00		U.S. 0		
China		Can.	U.S.			Dom. 2.5	Increase between 1-30%; (likely at low end)	None anticipated
	1991/f.o.b.	95.00	87.00			U.S. .7		
						Can. .2		
Egypt		Aus.	EC	U.S./SW		EC .7	None anticipated	None anticipated for lower dockage
	1989/f.o.b.	162.42	148.27	156.17		U.S. .6		
	1990/f.o.b.	160.94	124.95	128.26		Saudi .5		
	1991/f.o.b.	124.81	179.89	92.64		Can. .4		
						Arg. .4		
						Aus. .3		
Ghana		Can./CWRS		U.S./NS		U.S. 2.0	Increase 0.023 million tons	$5-$15 per ton (likely lower end)
	1987/*c&f*	138.00		120.50		Can. 0		
	1988/c&f	201.50 (Aug.)		147.90 (Apr.)				
	1989/c&f	214.50 (Nov.)		211.50 (May)				
	1990/c&f	151.50 (Nov.)		179.80 (May)				
	1991/c&f	127.35 (Jan.)						
Indonesia	C.i.f.	Aus. ASW	Arg. Hard	Can. CWRS	U.S.[3]	U.S. .5	None anticipated	None anticipated
						Aus. 0		
	1990	144.96	147.70	164.37	161.20	Can. 0		
		152.00			191.62			
					140.81			
	1991	151.00	149.21	163.43	132.00 (HAD)			
		151.00						
Italy	C.i.f.[4]	Dom.	Frn.	U.S./ DNS#2	Can./ CWRS#1	U.S. .8	Would buy more if cleaner; 0.15-0.20 million tons additional	$4-$8 per ton
	1988	331.00	328.00	518.00	514.00			
	1989	304.00	317.00	489.00	492.00			
	1990 (July/June)	330.00	332.00	498.00	501.00			
	1991 (July/Jan.)	321.00	322.00	505.00	507.00			

See footnotes at end of table.

Continued--

Table 7--Summary of key price and quality results--Continued

Country	Sample price relationships[1]					Average dockage	Anticipated change in U.S. imports from low-dockage wheat	Expected premium from low-dockage wheat
	Year/basis	*----------Dollars per ton----------*				*Percent*		
Japan	C.i.f.	Aus.	Can.	U.S./HRW		U.S. 0.7	None anticipated	Potential for
	1991	157.00	180.00	154.00		Can. .3		premium of around
						Aus. .3		$2 per ton
Morocco	C&f	Frn.	U.S./SRW			U.S. .7	None anticipated	None anticipated
	1988	164.60	167.70					
	1989	166.70	169.50					
	1991	106.00	133.20					
Pakistan	U.S.	Can.	Turk.	Aus.	Saudi	Testing is	None anticipated	None anticipated
	White	CWRS		SWW	Hard red	too crude to		
	156.78	158.18	122.00	179.49	120.75	be accurate;		
	F.o.b.	C.i.f.	C.i.f.	F.o.b.[5]	175.44	U.S. .5-.8		
	(all prices 1991)				C.i.f.[5]			
Philippines	C&f	Can.	HRS	White		U.S. .6-1.1	None anticipated	Yes; at least
	1989	191.37	212.58	198.59				$1 per ton
	1990	173.08	184.12	174.91				
	1991	129.86	127.28	123.00				
	1992		123.44	129.65				
Russia	C&f	HRW	HRS	SRW		EC > 1.0	Would be credit-	None anticipated
	1991	146.00	191.00	141.00		U.S. 1.0	determined	
	1992	144.00	160.00			Can. < 1.0		
	1992	ASW	CWRS					
		178.00	209.00					
South Korea[6]	C&f	WW	HRW	DNS		U.S. .7	1985: U.S.- 98% of imports	None anticipated
	1991	143.00	147.00	159.00		Aus. .2	1991: U.S.- 80% of imports	
	1992	202.00	196.00	203.00				
		AS	ASW	AH				
	1991	149.00	150.00					
	1992	197.00	190.00	195.00				
		CWRS#2						
	1991	136.00						
	1992	183.00						

See footnotes at end of table.

Continued--

Table 7--Summary of key price and quality results--Continued

Country	Sample price relationships[1]					Average dockage		Anticipated change in U.S. imports from low-dockage wheat	Expected premium from low-dockage wheat
	Year/basis	*Dollars per ton*				*Percent*			
Sri Lanka	F.o.b.					EC/Turk. >	U.S.	None anticipated	None anticipated
		WW	HRS	HRW	SRW	U.S.	.5		
	1989			169.00	165.00	Saudi <	U.S.		
	1990	108.00	175.00	141.00	159.00				
	1991	78.00	89.00	87.00					
		Saudi		Arg.					
	1990	145.00							
	1991			120.00 (c.i.f.)					
Taiwan	C&f	ASW	ASWW			U.S.	.7	None (at present)	None (at present)
	1991	166.00	156.00			Can.	.2	under reform,	$1-$1.50 per ton
		DNS	HRW	WW				would otherwise	(under reform)
	1991	159.70	157.01	174.84				lose market share	
		CWRS							
	1991	164.00							
Togo	Not available					U.S.	2.0	Increase 10,000 tons	$5-$20 per ton
						EC	1.0		(likely lower end)
						Can.	0		
Tunisia	From $1-$8 difference; U.S. wheat price is lower than EC wheat price					U.S. <	1.0	They will increase	None for dockage
Venezuela	C&f	DNS#2	CWRS#1	Arg.		EC	4.5	An increase of 20-30%	$3-$5 per ton
	1992	180.45	195.72	136.02		U.S.	.8		
	1992[7]	HAD#2	CWAD#1			Can.	.3		
		162.36	169.05						
Yemen	c.i.f.	HRW	White	ASW		EC	.9	Changes in imports	$18-$20 per ton
	1992	147.00	160.00	177.00		U.S.	.8	depend on EEP, credit	for clean white
		Saudi		Frn.		Can.	.4		wheat
		170.00		148.00		Aus.	.3		

Key: Arg.= Argentine, Aus.= Australian, Can.= Canadian, Dom.= Domestic, Frn.= French, Saudi= Saudi Arabian, Turk.= Turkish, U.S. = United States. [1]Prices net of deductions for dockage. [2]Prices do not include preferential tariff for Argentine wheat. [3]Prices for U.S. wheat shipped to Indonesia are for the following wheat classes (in order): HRW, DNS, SRW, and HAD. [4]Aggregates monthly average prices for soft wheat. [5]F.o.b. price is higher than c.i.f. due to seasonality of purchases. [6]Prices for South Korean imports are monthly averages (Mar. 1991 and Feb. 1992) rather than annual averages. [7]Jan.-April 1992 average for Venezuela.

The Consumer Preference Index: An Assessment of U.S. Wheat Quality

The interviews with foreign buyers of U.S. wheat included two sets of questions, (1) purchase criteria, and (2) quality factors. For the set on purchase criteria, interviewers asked buyers to rank the importance of such factors as price, credit availability, trade relationships, and overall quality associated with their choice of a country supplier for the dominant class of wheat. Then they were asked to rate the performance of U.S. wheat, and, where possible, the performance of a major competitor on each of the criteria they noted.

For the second set of questions, interviewers asked buyers to identify the most important quality characteristics in their purchase decisions, followed by a rating of U.S. wheat and the wheat of a major competitor on each of these listed factors. An index procedure was adapted from consumer preference literature (Reed, Binks, and Ennew, 1992). Respondents were asked to rank product attributes according to their importance and the quality of supply. Three indices were computed for each factor. The demand index is a measure of how important a buyer perceives a particular characteristic to be; the supply index measures the buyers' perception of how well products on the market perform on this characteristic; and the attainment index tells how the perceived importance of the characteristic (for example, demand) matches product performance. The attainment index is crucial because it shows how a supplier is performing relative to what the market wants. Because each respondent represented different market power, we calculated each index taking into account each country's 1991 share of world imports and allocated that share across the number of responses for that country. Respondents did not all identify the same quality characteristics as important in their purchase decisions. Thus, we report only those characteristics for which we have sufficient observations (20 was established as an arbitrary minimum) for calculating a meaningful index. Indices are scaled from zero (least important or worst performance) to 10 (most important or best performance) to help interpret the results.

Table 8 shows the three indices for the United States for the purchase and quality criteria with at least 20 observations. Price and quality were the only general purchase criteria rated by a sufficient number of respondents. U.S. wheat performed slightly better on price than it did on overall quality. This may reflect the effect of the Export Enhancement Program (EEP) in lowering prices to key importing countries. The responses to the quality characteristic questions were more varied. The importance attributed to the characteristics listed in the demand index corresponds roughly to how frequently they were cited, which is expected given the way the interviews were structured. Protein quantity was rated the most important quality factor, followed by gluten quality, moisture, and nonmillable material. The grade-determining factors listed--shrunkens/brokens, test weight, and total defects--were rated of less importance with a demand index between 4.5 and 5.1. The supply index indicates that the U.S. wheat did not do very well, with only test weight, total defects, and falling number at or above the midpoint of the scale.

This poor performance also shows up in the attainment index calculations, where U.S. wheat falls below the midpoint of the 10-point scale for all of the major quality factors except test weight, total defects, and falling numbers. The lowest score among the quality characteristics is for nonmillable material that consists of dockage and foreign material. Levels of these factors are usually much higher for U.S. wheat shipments compared with Canadian and Australian wheat shipments.

The attainment index score of 2.1 for protein quantity is the most significant for the long-term quality competitiveness of U.S. wheat. For a given class of wheat, the United States is perceived as being unable to provide the level of protein that buyers expect. Buyers of wheat usually use a class designation or a class with protein specification to get the protein content they want.

Table 8--Buyers' perceptions of the quality of U.S. wheat

Scaled indices	Index No. 1	Index No. 2	Index No. 3	Number of observations
	Scaled from 1-10			
Purchase criteria:				
Price	8.8	6.9	6.7	60
Quality	7.5	6.0	5.7	58
Quality characteristics:				
Falling number	3.8	5.0	4.0	23
Gluten quality	8.3	3.7	3.4	52
Moisture	8.0	4.2	3.6	46
Nonmillable material	7.9	1.3	1.3	50
Protein	9.6	1.8	1.8	58
Shrunkens/brokens	6.1	3.6	3.2	29
Test weight	5.5	5.4	4.5	33
Total defects	5.6	4.5	3.8	24

Key: Index no. 1 = demand, index no. 2 = supply, and index no. 3 = attainment.

country's wheat market and their influence over quality specifications in export contracts, such as state traders, private traders, and millers, (2) the composition of domestic consumption and policies that drive the decision on how much to import, and (3) the factors, including price, credit, trade-servicing relationships, and quality, that lead a country to choose the source(s) of the wheat they import. This process can be illustrated within the structure of a two-stage purchasing procedure, in which importers decide (1) how much wheat and what aggregate quality to seek, and (2) how to satisfy those quality needs among import sources (Hjort, 1988). The country in question implicitly establishes a budget for wheat imports based on total demand.

In the first stage of the purchasing procedure, the government explicitly or the private sector implicitly estimates the year's import needs by determining the upcoming year's domestic wheat production and consumption. The level of production and/or consumption may be affected by government intervention, so policies relevant to the wheat sector are examined in this report. Import needs may be tailored as much as possible to the end-use demands of wheat consumers, within the established financial constraints and overall import priorities.

The second stage of the process involves satisfying those import needs by selecting the source(s) and type(s) of wheat. The import decisionmaking framework incorporates such elements as price offered (and related factors, such as export subsidies, food aid, and export credit), the quality of the wheat, trade-servicing reliability, and presence of bilateral agreements or political ties with competing exporters. The importance attached to each element varies between importers. As quality is the focus of this study, this area is examined in some detail.

In order to delve into more specific details assembled during the completion of the country case studies, we prepared a lengthy summary of the individual country results. The wheat market in each of these countries is unique, requiring different approaches by traders, and in cases where distinctions between countries within a given grouping are vital to the import decisionmaking process, these differences are discussed. However, the aspects that these markets have in common are also explored in an effort to characterize importing behavior within segments of the world wheat market. In this section, the high-income countries are dealt with first, and this group is represented in this study by Italy, Japan, Taiwan, and South Korea. China and Russia are treated separately because of their large import volumes and unusual market structures. The remainder of the countries studied are low- or middle-income, and are aggregated along primarily regional lines in the following way: low-income Asian (Indonesia, Pakistan, the Philippines, and Sri Lanka), Middle Eastern and African countries (Egypt, Ghana, Morocco, Togo, Tunisia, and Yemen), and Latin American countries (Brazil and Venezuela).

High-Income Countries

Although all four countries discussed in this section (Italy, Japan, South Korea, and Taiwan) are high-income and have fairly sophisticated demand for wheat products, the course each country takes to realize demand for high-quality wheat differs. Market shares of high-quality wheats (HRS, CWRS, CWAD, HAD) generally appear to be highly correlated with per capita income, although the relationship between high protein levels in imported wheat and income levels is clearly not monotonic (U.S. Congress, 1989). For these countries, their high-income levels probably allow them to be more selective in their import decisions, with more freedom to consider quality as the key factor than most countries. These countries appear to be more quality-conscious as a result. Despite the activity of monopolistic traders operating between

exporters and end-users in two of the four countries studied, quality characteristics (or end-use requirements) still play a key role in determining the source of imported wheat in these high-income countries.

Whether filling primarily niche markets (as in the EC), or in providing a whole range of imported wheat (as in the Asian high-income countries), the quality of the wheat, particularly its intrinsic characteristics, ranks among the most important determinants of import decisions for these purchasers. Within the list of important quality factors, dockage was not the top concern in any of the four countries. Rather than prompting an increase in market share above current levels, the ability to deliver cleaner grain was regarded by respondents in South Korea and Japan as having the potential to help stem a decline in U.S. market share. In order to increase the U.S. share of these segmented wheat markets, some of the intrinsic characteristics, such as variability in protein quantity and color, must also improve.

In this section, Italy was selected to represent the high-income countries, found particularly in Western Europe (others include the United Kingdom, Norway, and Belgium), that grow nearly enough wheat domestically to meet domestic demand, but import small amounts of wheat with very precise quality characteristics to fill specific, sophisticated niches in their wheat demand (table 9). On the other hand, Japan, South Korea, and Taiwan are examples of high-income countries (other such countries include Singapore and Hong Kong) with relatively limited production (accounting for less than 15 percent of domestic consumption even in Japan), which consequently have to import a large volume and a variety of wheat classes to fill their needs.

Table 9--High-income wheat importers, 1991 statistics[1]

Country	Population	Wheat imports
	Millions	*Million tons*
Western Europe:		
Belgium/Luxembourg	10.3	0.04
Finland	4.8	.03
Germany[2]	78.7	.04
Italy*	57.8	.64
Netherlands[3]	15.0	.01
Norway	4.3	.17
Sweden	8.6	.04
Switzerland	6.8	.20
United Kingdom	57.7	.35
Asia:		
Hong Kong	5.8	.38
Japan*	124.1	5.75
Singapore	2.8	.20
South Korea*[4]	43.4	4.39
Taiwan*	20.8	.90

*Countries represented in study. [1]Wheat imports for EC-12 members include extra-EC imports only. [2]Represents import data from 1988/89 (West Germany). [3]Represents import data from 1990/91. [4]South Korean wheat imports for food use are typically about 2 million tons. Sources: U.S. Department of Commerce, Mar. 1990; USDA/FAS Dec. 1992 (b), and compilation of attache reports for EC countries.

Major Players in Import Decisions

In Italy and other wheat-importing countries in Europe, decisions on how much wheat to import and from whom are made by many private traders and millers, although EC policies do constrain the volume and type of imports through use of variable levies. Non-EC European countries (Finland and Switzerland, for example) typically import wheat from the EC, due to lower transportation costs, and buy very little from other sources. Some EC members (including Italy) are involved in both intra-EC trade and buying from outside the EC.

Wheat trade between EC countries occurs without significant barriers and is conducted between large farmer cooperatives, multinational traders, private traders, and large, vertically integrated companies. The same players import some wheat from countries outside the EC (although cooperatives play a smaller role), despite facing an enormous variable levy to do so. These importing firms deal directly with multinational traders or the Canadian Wheat Board in wheat purchases. Small-scale millers and processors buy from the traders who handle imported wheat, but the traders (and large millers) generally make the deals and set the quality specifications in the contracts. In Italy, the common wheat milling industry has mostly small-scale millers, but durum milling into *semolina* for pasta is more concentrated (the top six firms control more than 30 percent of the market).[7]

[7]Common (or soft) wheat is a category used by many countries (especially European countries or countries colonized by Europeans) to include all nondurum wheat classes.

In the Asian high-income countries, the list of key players in the wheat import process is most often headed by monopolistic trading entities (state-run in Japan, privately run in Taiwan). In 1983, South Korea ended its state monopoly on wheat imports, but Japan and Taiwan still maintain central buying structures through the activities of their Food Agency and Flour Millers Association (TFMA), respectively. About 11 Japanese trading houses respond to tenders (class-specific) issued by the Food Agency, which sets contract specifications. The trading houses then arrange the details of the import transactions with overseas exporters. Japanese millers can mainly influence Food Agency specifications through the lobbying efforts of their representatives (the Wheat Millers Association). Both the milling and baking industries are fairly concentrated in Japan; the top four firms in each sector own 55 and 40 percent of capacity.

The millers association is the trading agent in Taiwan. All deals are promulgated by a government agency, the Board of Foreign Trade. That board decides on annual quota amounts and import sources jointly with the TFMA. The TFMA sends officials on highly publicized wheat tours in major exporting countries, seeking out the wheat that best meets their end-use requirements, and millers have some influence on quality specifications of contracts through their representatives on the TFMA committees. Beginning June 1, 1993, wheat trade will be partially liberalized in Taiwan by allowing millers who are not members of the TFMA to import. The quota and base price systems are likely to remain.

In South Korea, the three largest milling firms handle about 80 percent of the wheat milled. The large flour mills deal directly with traders or wheat boards in the exporting countries. Many of the smaller mills purchase jointly through their millers' association, the Korean Flour Millers' Association, which used to hold the monopoly on all wheat import purchases. The Korean baking industry is much less concentrated, with 8,000 small-scale "window bakeries" in operation. Quality preferences are conveyed through price signals from end-users (bakers, noodle, and cracker producers) to millers.

Key Factors Affecting Import Volume Decisions

The domestic production situation in Asian high-income countries differs from that seen in Western Europe, and these differences affect the complexion of their wheat import demand. Western Europe is a major wheat-producing region. On the other hand, because of their climates and unsuitable soil types, very little wheat is grown in these Asian countries. While rice is still the staple food for many, the increasing influence of Western culture has led to the diversification of the Asian diet, increasing demand for a variety of wheat products. The high-income Asian diet still includes traditional Asian noodles, but also incorporates growing demand for hard bread and rolls for fast-food products. Growth in wheat food use is flat in Japan and South Korea (annual per capita flour consumption is about 35 kilograms (kg). That growth rate is at or just above the population growth rate. Wheat food demand continues to rise in Taiwan (per capita flour consumption at 30 kg per year). Korean demand for imported feed wheat has grown rapidly since it was first allowed in 1983, now accounting for up to half of wheat disappearance.

Per capita food consumption of wheat (flour equivalent) averages 72 kg per person in the whole EC in 1989, slightly above levels in North America. However, intake varies widely between EC members, from 44 kg in Denmark to 103 kg in Italy and Greece. Grain for domestic milling is generally purchased directly from producers or from local elevators. Only 20 years ago, the EC imported nearly 6 million tons of wheat from the United States and Canada, much of it high-protein wheat. The widening use of wheat gluten in the EC since the mid-1970's (except in Italy, which currently bans the use of *vital wheat gluten* because it is regarded as degrading bread quality) has reduced the need for high-protein wheats for blending and has increased the share of low-protein wheats in the typical EC wheat mill mixture.[8] The Italian ban on use of vital wheat gluten is expected to end when all national phytosanitary rules must harmonize with EC rules when EC integration is completed.

The EC Common Agricultural Policy (CAP) has enabled the EC as a whole to attain wheat self-sufficiency, so more than enough wheat is produced to satisfy internal demand. In addition, to prevent cheaper wheat imports from outside the EC from disrupting the CAP, the EC has used a variable import levy (gross) approaching $200 per ton. Despite these constraints, EC nations still import 1.5-2 million tons of high-quality *niche wheat* from outside the EC (called third-country imports).

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[8]Wheat gluten is about 75 percent protein, and can be used to fortify flour rather than blending high-protein and low-protein wheats. It is obtained by 'washing' a dough of wheat flour and water, but must be kept at stable, low temperatures or its usefulness is limited (Gilles and Sibbit, 1974).

Italy usually imports about 700,000 tons of third-country wheat imports, the United Kingdom usually imports 300,000-400,000 tons, and Belgium and the Netherlands also usually import at least 40,000 tons each of such wheat (ISTAT, 1992). The wheat products demanded by consumers require a certain amount of high-protein wheat that cannot be consistently acquired within the EC. Hence, these imports continue, despite the considerable added costs generated by the variable levy, because Italian pasta and bread makers still insist on a certain proportion of North American wheat in their flours. Pasta makers find that EC durum cannot match the North American varieties in terms of color and gluten elasticity. In these specialized product markets, the need for quality wheat overwhelms all other factors, even the sizable constraint created by the CAP. The relative prices that matter are those that prevail between U.S. and Canadian wheats in those small but very particular markets.

The single most important policy mechanism affecting wheat markets in Japan and Taiwan is the presence of a central buying organization. In addition to controlling how much wheat is imported, the respective organizations select the source and class of the wheat to be imported, and in both countries they charge an administratively determined price (generally well above world levels) to millers and processors. This base price is set each year and does not vary with changes in the world market price. The gap between world price and administered price tends to dwarf the price differentials that the central buyer maintains between wheat classes. This gives millers an incentive to seek the best quality available (as in U.S. No. 1). The base price mechanism also affects flour price.

Taiwan also has an import tariff, but it does not seem to affect trade as much as the central buying system with its state-imposed quotas. Wheat imports for feed use are not permitted in Taiwan, even when prices are competitive. The revenue from the differential between the Taiwanese administered price and the world price is used to support rice production. The domestic-world price differential in Japan supports the operations of the Food Agency. South Korea has no policies that directly affect wheat importing, except for official testing for pesticide residue at ports. The South Korean ban on rice imports indirectly encourages wheat trade, although with higher domestic rice output, the linkage has been weakened.[9]

Key Factors in Determining Import Source

The wheat import markets in the EC countries are largely segmented, with each wheat class demanded having only two or three potential sources for purchase and little substitution between classes (except for the high-protein wheats). For example, while Italy buys a lot of French common wheat (averaging more than 3 million tons over the last 3 years), this low-protein wheat does not compete for the same niches in the Italian wheat market as do the higher protein U.S. and Canadian wheats. The use of vital wheat gluten in other EC countries has created scope for substitution between EC and third-country wheat.

In the same way, the Asian high-income countries make tenders based on country and wheat class. Extensive interviewing suggests the following product-wheat matches (these market segments do not overlap very often, given these users' very precise end-use specifications):

- For bread, U.S., Canadian, and Australian high-protein wheats (HRS, HRW, CWRS, and APH).
- For noodles and confectioneries, U.S. and Australian low- and medium-protein wheats (lower protein HRW, SRW, U.S. white, AH, ASW, and Australian soft).
- For feed use, low-protein Canadian, Argentine, Turkish, and EC wheat (in South Korea and Japan).

Suitable end-use characteristics, such as gluten quality, protein quantity, and color, are key considerations, as important in some respects as price in the high-income countries. Within the range of quality attributes that can be measured easily by wheat handlers, those that relate to grain's *intrinsic value* rank highly in interviews in all of these high-income countries, and cleanliness factors typically rate less concern (dockage ranks fourth among quality factors in both Japan and Taiwan).

In the interviews, users of imported grain listed protein quality and quantity, sprout damage (measured by the falling numbers test), pesticide residue, moisture content, and shrunken and broken kernels as important factors in determining where to buy wheat. Variability in protein levels is a particular concern: millers in South Korea and Japan stated that protein levels in white wheat shipped

[9]Current estimates show a cross-price elasticity of wheat demand with respect to rice price of 0.15.

from the United States were too high for the desired end-uses (cookies, pretzels, crackers, and cakes), and some Italian, Korean, and Japanese millers maintained that protein levels in HRS have been too low. Data show quite clearly that the quality of U.S. wheat shipped to the EC is more variable, particularly with respect to end-use characteristics, than is Canadian wheat. In a study of the U.K. wheat import market, aside from flour protein and flour ash, the variance of end-use performance characteristics was 10-20 times greater for U.S. HRS wheats than for Canadian wheats in the early- to mid-1980's (Wilson and Preszler, 1992).

Dockage is featured in contract specifications in all of these high-income countries but is not regarded as a primary concern. Dockage achieves a somewhat greater degree of importance in Japan and Taiwan because screenings use in livestock feed is limited, and disposal of screenings creates environmental problems. Use of screenings in animal feeds is outlawed in South Korea, but they appear to still be widely used for that purpose.

Pricing plays a more important role in these countries when the quality characteristics of the competing wheats are judged to be comparable. For many of the specific end-use demands, however, millers and processors interviewed simply do not believe that the quality of wheat bought from different sources is the same. Pricing is the chief concern for only feed wheat. Among the countries studied in the high-income country category, only South Korea receives price assistance for exports. South Korea receives export credit guarantees (GSM-102) from the United States. The credit guarantees are important because commercial credit with terms greater than 2 months and less than 1 year is difficult to obtain in South Korea.

The Canadian and Australian Wheat Boards have negotiated agreements for the past 20 years with Japan. The CWB has an exclusive arrangement for durum sales with a single trader in Italy. These arrangements tend to assure a continuing relationship between the parties and for Japan, provide specific guidelines on the amount of trade. The need to maintain amicable trading relationships with the United States is important for Taiwan and Japan; both countries have extensive merchandise trade surpluses with the United States and buying U.S. wheat is one visible way to reduce the political friction resulting from this trade gap.

Despite the importance of specific demands for end-use characteristics and other considerations, all of these countries would welcome a lower dockage level in U.S. wheat. Some traders contemplate paying a slight premium for cleaner U.S. grain (perhaps 1-2 percent), but dockage is generally treated as only one consideration among many. U.S. wheat currently delivered to these countries has much more dockage than wheat from the other major exporters. Interviews found that U.S. dockage levels were typically at least twice as high as Australian and Canadian levels. Such levels result in losses to traders due to dockage assessments and sometimes additional penalties, especially for Taiwan.

Russia

In the last few decades, the political entity that was once the USSR has been among the largest importers of wheat, and has seriously influenced the operation of the world market. The breakup of the former USSR and the transition to market economies in the various republics make it difficult to determine the future world market role of the republics. We will, therefore, limit our discussion to the situation that is developing in the Russian Federation, which is the largest political and economic player among the republics.

The current structure of the Russian import system is not favorable to the success of a U.S. initiative to enhance market share by selling cleaner grain. The focus for purchasing wheat rests almost totally on getting the most quantity for the least money (which must be combined with credit), so quality plays only a tertiary role. At this time, there may be a demand for low-dockage grain downstream in the marketing system, but the system is not capable of communicating such demand to the world market. A privatized system might induce an effective demand for quality, but the accompanying increase in efficiency throughout the entire system may well lead to other consequences, which could reduce wheat imports. A more efficient system would likely reduce domestic grain waste and spoilage, expedite grain trade between republics, and restore the wheat-to-feed grains price ratio to one that more closely resembles the world price ratio (which tends to favor using coarse grains for livestock feeding). Such a change on net is likely to reduce, rather than raise, total Russian wheat import demand. In such circumstances, the United States could be facing a more quality-conscious market of much-reduced size.

Despite the fact that as one country the former USSR was one of the world's largest producers of wheat, over the last several years, a chronic shortfall has persisted between consumption and production.[10] The key reasons for this have been an inefficient and wasteful production and distribution system and a centralized pricing and allocation policy that has skewed relative prices between feed ingredients and subsidized consumer food prices. Over the last 5 years, wheat imports by the former Soviet Union, excluding the Baltic States (FSU-12), have averaged more than 17 million tons.

Major Players in the Import Decision

The chief player in day-to-day grain importing remains the state trading agency, Exportkhleb, which handled transactions for the former Soviet Union and is now a joint stock company with the majority of shares held by the independent republics. Each of the republics of the Commonwealth of Independent States (CIS) makes decisions at the cabinet level on when and how much to import, but many still depend to some extent on the accumulated expertise of Exportkhleb officials to execute trades. Contract specifications (including quality) are established jointly by Exportkhleb and each republic's committee on grain products. The governmental mechanism exists to allocate export credit to private traders, but this has not yet occurred in the FSU-12. Private traders currently participate in the domestic market and in a few of the barter deals. Millers and processors (state-owned) have no role in setting import quality specifications.

Key Factors Affecting Import Decisions

Despite an annual wheat harvest averaging more than 80 million tons over the last 5 years, the procurement process used in the former Soviet Union has had difficulty acquiring sufficient domestic milling quality wheat to meet human consumption requirements. This failure has forced government officials to look outside to ease the wheat deficiency. Three factors govern the necessity to import milling-quality wheat: (1) the poor distribution system, (2) the recent reluctance of farmers to sell their crop to the state because they prefer to hold on to wheat for feeding or sell it on the open commodity market, and (3) a large proportion of the wheat is suitable only for livestock feeding due to lower quality caused by poor storage practices, lack of pesticide, and other factors. This shortfall has probably been aggravated over the last year by the decaying distribution system in the CIS, since Russia has been a grain-deficit region for many years.

Despite these problems, Russian officials speak in terms of having high-quality wheat ready for export within 10 years.

The wheat imported into Russia goes for both human consumption and livestock feeding. Nearly half of total domestic consumption appears to be devoted to feed use, which reflects a considerably higher proportion of wheat feed use than seen in any other country. Per capita consumption of wheat flour products in the republics was estimated at more than 100 kg in the late 1980's, but large amounts of bread have been fed to livestock due to the misaligned feed grain (and grain products) price system. Under the Soviet system, prices of all major consumer goods were established by central control. This resulted in a considerable consumer subsidy. During 1992, the Russian Government freed the prices of virtually all consumer goods, although the other republics have not moved quite so fast. In Russia, only the price of low-quality bread is still controlled among wheat products. The higher prices are expected to choke off a certain amount of surplus wheat demand, both directly for wheat flour products and indirectly through reductions in demand for meat products. Although the grain harvest has improved over the last few years, and a reduction in domestic wheat demand is expected, the Russian Government still apparently plans to import several million tons of wheat in 1993/94.

The need for credit assistance in nearly all categories of agricultural imports has dominated the timing and sources of wheat imports for several years. Russia now buys nearly all of its wheat under export subsidy programs (EEP and EC restitutions), export credit programs (USSR first granted access to GSM credit in 1990), and/or barter arrangements. In the past, the former Soviet Union sold valuable minerals and crude oil to earn hard currency. This foreign exchange paid for most grain imports (except with Eastern Bloc trading partners). However, productivity in those sectors is decreasing and the overall external debt burden is now enormous. Commercial credit is now difficult to obtain for governmental institutions of the former USSR. Such credit is obtained only because of extraordinary guarantees against default offered by the exporting government. Little wheat trade is occurring outside of combined credit and subsidy

[10]All historical statistics cited in this section are for the former Soviet Union, excluding the Baltic republics, except where explicitly stated otherwise.

programs except barter arrangements between individual republics and exporters, which allow individual republics to receive export subsidies directly, since at least those conducted with U.S. traders are noncredit transactions.[11]

Key Factors in Determining Import Source

Credit availability and price paid are the two most important factors in determining the source of imported wheat. Quality is only a secondary concern, but it may well become more of a factor as various parts of the wheat marketing channel are privatized within the republics of the former Soviet Union and economic conditions improve.[12] The interviews indicated that Canadian wheat and sometimes Australian wheat are perceived by millers and processors as being of higher quality than U.S. wheat. In 1990, Exportkhleb officials said in Senate subcommittee testimony that wheat imports from Canada and Australia are consistently cleaner and more uniform than the grain bought from the United States (Cowan, 1990). The quality factors that were deemed most important by end-users were moisture, gluten content, wheat hardness, test weight, dockage, weed seeds, insect damage, and pesticide residue. Intrinsic characteristics (gluten content and hardness) in general were judged by end-users as more important than physical (dockage) or wholesomeness (weed seeds, insect damage, pesticides) concerns.

For milling-quality wheat, the millers would prefer to use high-protein U.S. and Canadian wheats (HRW, HRS, and CWRS). Most low-protein wheat (both milling-quality and feed-quality) comes from the EC and Hungary. The opinions of end-users on these matters, however, currently have no impact on the purchasing decisions. Over the last few years, the United States and Canada have both held 20-30 percent of the Soviet market, with a 10- to 20-percent share for the EC (mostly France) and a 10-percent share for Hungary. Hungary's share is likely to be stable in the short run, although its exports to the former USSR now depend on barter arrangements and triangular credit deals arranged by a third party (such as the EC). While Australian wheat is regarded as high-quality by Russian end-users, Australia's reluctance to offer credit assistance because of previous repayment problems with other commodity sales has lowered its market share in recent years. The risk to the U.S. market share implied in earlier complaints about U.S. wheat quality seems to have been obscured in the last year or so because of the overwhelming need to buy with credit.

Within recent purchases from the United States (although HRW is the dominant class), sales of higher priced HRS have declined while sales of lower priced SRW have increased, which suggests the possibility of economizing behavior by the Russians or perhaps outside pressures (such as the International Monetary Fund or the World Bank) on their buying habits. It appears that in the last couple of years, the Russians have been settling for blending more medium-protein wheat (12-13 percent levels found in HRW) with low-protein wheat for their bread flour rather than buying as much HRS (with 14-15 percent protein) for that purpose. While the Russian Government continues to import large volumes under credit and subsidy terms, quality is not likely to be a major determinant of class or source of imports. A private Russian wheat sector, when it occurs, is likely to seek lower quantities of wheat on the world market but may be more quality-conscious but still price-conscious.

China

China ranks among the world's largest wheat producers and importers, averaging production of more than 90 million tons and imports of almost 14 million tons over the last 5 years. Unlike Russia, however, China has had few hard currency problems and buys on cash terms only, so it appears to be fairly efficient in parlaying its position as a major wheat importer into the exercise of market power. China succeeds in playing rival exporters against each other and receives export subsidies or low prices for the wheat it buys. Quality plays a secondary but still important role in the import process, with strictest care paid to meeting quarantine requirements and also to key wholesomeness and intrinsic characteristics (live insects and certain weed seeds in the first group and gluten quality in the second). High dockage in U.S. wheat is an

[11]Under one type of barter arrangement, the Russian Government sells some commodity (such as oil or timber) to a third party (usually a Western company) and uses the cash received from that transaction to purchase wheat. A few transactions of this kind for U.S. wheat occurred in late 1992 without resorting to use of GSM export credits.

[12]The shift to a convertible ruble could also greatly raise the price of imported wheat to millers, which clearly would affect their readiness to seek imported wheat because of quality preferences, particularly if the Russian Government cuts off subsidies to domestic producers.

irritant to China's importing officials and the provision of lower levels of dockage might slightly enhance U.S. market share.

Major Players in the Import Decision

All wheat imports into China are handled by the state's foreign trading organization, CEROILS. CEROILS officials are active traders, stationed in major exporting countries. CEROILS deals with both multinational private traders and wheat boards in exporting countries. China's Grain Bureau, an arm of the Ministry of Commerce, procures grain for urban distribution from farmers, buys some on the open market, and acquires the rest through CEROILS' imports. Millers have no direct voice in establishing contract specifications, although they can convey suggestions to the Grain Bureau. In interviews, many flour millers stated that they seldom get the end-use characteristics that they desire.

Key Factors Affecting Import Volume Decisions

China's domestic wheat production has increased considerably over the last decade, but wheat demand has grown even more rapidly. Substantial change occurred in China's rural economy in the 1980's. The biggest change has been in the land tenure system, which has gone from primarily a commune system to one in which individual families negotiate with villages to cultivate plots of land. Farmers are required to sell a portion of their grain to the Grain Bureau in order to have access to land use rights, but a growing proportion of their grain is sold on the open market (to private individuals and to the government), and a great deal is consumed on the farm. China's wheat production rose markedly over the last decade (annual growth of 4.0 percent); much of the gain was attributable to structural changes (including the new land tenure system). China's trade policy favors bulk wheat imports (no tariff) over wheat flour imports (a 9-percent tariff for exporters with most-favored-nation trading status).

Domestic consumption of wheat has climbed along with production levels, so imports are still necessary to maintain the growth in wheat consumption resulting from higher population and rising income. Most of the wheat consumed in China goes for food use--between 3 and 6 percent of production disappears due to waste and spoilage, and feed use accounts for only 1-2 percent of total disappearance. Much of the imported wheat goes for urban use as the countryside consumes an increasing share of domestic production. Per capita food consumption of wheat flour products in China was estimated at about 67 kg in the late 1980's, a rate comparable with those in North America and much of Western Europe.

The cost of the implicit food subsidy to urban consumers (because of the difference between the low administered urban retail flour price and the higher wheat procurement price paid by the Grain Bureau) grew to more than 10 percent of all central budget outlays in 1990. Urban flour prices were increased in 1991 and 1992, but the Government is giving some cash subsidies to help consumers adjust to the higher prices. Since the subsidy is paid in cash rather than in-kind, some of that subsidy is likely to be diverted for the purchase of other goods, which economic theory suggests should lead to a decrease in the level of per capita urban wheat consumption.

Key Factors in Determining Import Source

Price is the most important determinant of China's choice of imported wheat source. China buys strictly on cash terms, and uses its substantial market presence to wrest export subsidies or otherwise low price offers from all the major wheat exporters. Over the last few years, on average, China has purchased about 40 percent of its wheat from the United States (typically mostly SRW), just over 30 percent from Canada, 12.5 percent from the EC, and less than 10 percent each from Australia and Argentina. Since 1987, China has bought little U.S. wheat that does not fall under the EEP, and CEROILS traders are keenly aware of prevailing price relationships between the major exporters. Unlike many major wheat importers, China generally avoids bilateral agreements, because it does not wish to commit itself in advance to a purchasing pattern among competing exporters.[13]

Quality follows price in determining where to buy wheat. China's consumers are becoming more quality-oriented. China buys high-protein spring wheats (from Canada), medium- to high-protein winter wheats (from Australia, the United States, and Argentina), and low-protein winter wheat (from the United States and the EC). China's buyers and end-users rate U.S. wheats behind both Canadian and Australian wheat in terms of end-use value; this compares CWRS against lower protein U.S. wheats (primarily HRW and SRW). In many ways, the United States is treated as a residual supplier in this market,

[13]An exception to this rule was a long-term agreement with Argentina for 1 million metric tons a year between 1989 and 1991.

along with the EC. China has certain quarantine and health-related requirements that are crucial in determining whether to admit a cargo of wheat; these include the presence of Johnsongrass seed, TCK smut (a wheat disease), pesticide residue, and live insects. Other key factors cited are protein content, gluten content, and nonmillable materials. A moisture maximum is also included in contracts.

With regard to dockage as a separate factor, CEROILS specifies 0.1 percent of dockage weight as nondeductible, 0.11-0.80 percent of the weight fully deductible, and above 0.80 percent deductible and penalized as well. The tendency for U.S. wheat to have rather high dockage has caused some loss in sales, as its presence and the possibility that it contains Johnsongrass seed creates problems for officials in the grain industry. Some government officials who were interviewed report that the quality of U.S. wheat has improved over the last few years, and they would welcome a continued decline in dockage content. Lower dockage levels would also reduce problems with pesticide residues and live insects. China's end-users are not willing to pay a premium for cleaner wheat, but some respondents suggested that China may increase purchases of cleaner U.S. wheat.

Although a few officials interviewed suggested a large increase (up to 30 percent) of imports of U.S. wheat would occur, ERS analysts believe that a modest increase in the U.S. share of the Chinese wheat import market is most likely. Some millers believe that China will continue to import U.S. wheat primarily for blending with higher protein Canadian wheat even if U.S. wheat were to be cleaner. In addition, they believe that the current $10 price difference (f.o.b.) between U.S. and Canadian wheat is not large enough to warrant a large increase in wheat imports from the United States even if the U.S. wheat were cleaner. Chances for more of a gain would be enhanced if grain trade were liberalized, so that foreign policy factors would matter less and end-users would be given a more direct role in setting quality specifications. Individual millers may be directly involved in specifying their quality needs if the role of CEROILS is diminished, as some predicted might occur.

Low-Income Asian Countries

The four low-income Asian countries (Indonesia, Pakistan, Sri Lanka, and the Philippines) included in this study represent points along a timeline of evolution of wheat marketing systems within a single region: full state-trading, partial state-trading, and fully privatized trading. They also represent a spectrum of reliance on wheat imports; from Pakistan, which normally produces most of its own wheat, to the other three, with no indigenous production. Their differences in these respects creates a different sensitivity to quality as a factor in import decisionmaking, despite their other similarities. These countries had per capita incomes in the late 1980's that were between $400-$750. These countries represent markets in South and Southeast Asia, a region of more than 1.6 billion people, that imported nearly 11 million tons of wheat in 1991 (table 10).

To the extent that quality characteristics are considered in the decisionmaking framework in all four countries, protein or gluten content, moisture, test weight, and kernel color are cited most frequently as important. Dockage is only a secondary quality consideration, particularly in the face of controlled flour prices and/or situations where restrictions on coarse grain imports make millfeed an attractive livestock feed.

Table 10--Low-income Asian countries, 1991 statistics

Country	Population	Wheat imports
	Millions	*Million tons*
Afghanistan[1]	17.1	0
Bangladesh[1]	121.8	2.0
Bhutan[1]	1.6	0
Brunei	.4	0
Burma	42.1	0
Cambodia	7.1	0
India	866.3	.1
Indonesia*	183.6	2.3
Laos	4.1	0
Malaysia	17.9	1.0
Nepal[1]	19.6	0
Pakistan*[1]	117.5	2.3
Philippines*	67.7	1.6
Sri Lanka*	17.4	.7
Thailand	55.8	.5
Vietnam	67.6	.1

*Country featured in study. [1]Also produce wheat domestically.
Sources: U.S. Department of Commerce, Mar. 1990 and USDA/FAS, Dec. 1992(b).

Major Players in Import Decisions

State trading in wheat has long been the practice in many Asian low-income countries, and state traders remain the sole marketing agent in Indonesia and Sri Lanka. The government agencies in these two countries procure the wheat, but since milling in each country is dominated by a single company, these millers appear to have considerable voice in government wheat import decisions.

The state trading agency (the Ministry of Food, Agriculture, and Cooperatives) also dominates Pakistan's wheat imports, but wheat imports were permitted by private traders in late 1991 and the role of private traders is likely to expand over time. The key constraint on private imports is the government's pricing policy, which operates to keep domestic prices below world prices in most instances. Hence, traders subject to world price fluctuations face the risk of importing wheat at a price well above the price offered by the government. Private trade accounted for only 7 percent of imports in 1991. While Pakistani millers directly influence private import decisions, they have no direct role in government import decisions. Decisions on the volume of state wheat imports are made at cabinet levels, and tendering and bid selection are handled by a government agency. Bakers and processors in Pakistan, Sri Lanka, and Indonesia have very little say in wheat selection and are often frustrated by their lack of knowledge of the origin of wheat in their flour. The large-scale miller in Indonesia has influence over specifications, but does not have rigid standards.

At the other extreme, state trading was abolished in 1986 in the Philippines, and the 12 millers who constitute the entire sector import either directly or through their trade associations. While sensitive to price terms, Philippine millers are also sensitive to quality concerns and voice their preferences more effectively than in Sri Lanka or Pakistan. Bakeries are generally small-scale in the Philippines, and none wield much power in setting quality specifications in import contracts, although millers do respond to complaints about flour quality. On the basis of experiences in these low-income Asian countries, state trading appears to impede the communication of quality preferences to parties involved in the trade, and its removal (as in the Philippines) appears to help in transmitting those preferences.

Key Factors Affecting Import Volume Decisions

Decisions regarding how much wheat to import in the state-trading countries are more closely linked to the countries' broader food and trade policy goals than to wheat import prices and quality concerns, although minimizing cost of imports is always crucial. The government decides on the wheat imports needed to meet food policy goals and also allocates wheat to millers at an administered price. In Indonesia and Sri Lanka, where rice is the primary staple, the administered price of wheat is influenced more by consumption, production, and price of domestically produced rice, rather than the price of imported wheat. Sri Lanka normally has a 20-percent duty on wheat imports (and a ban on flour imports since 1980). That duty is now waived to prevent a rise in world prices from affecting domestic price stability.

In Pakistan, policies tend to increase wheat import requirements, as the key policy objective is to maintain low and stable consumer wheat prices. The Pakistani Government provides assistance (for example, irrigation and credit subsidies) to wheat producers, but producer and consumer prices are typically held below the import parity price, resulting in effective taxes on producers and subsidies for consumers.

The Philippine Government imposes a 10-percent duty on imported wheat, and wheat flour is subject to both a 30-percent duty and an additional 10-percent value-added tariff imposed on all processed agricultural imports. In the Philippines, the government operates a dual pricing system for rice, in which producers receive prices at or above world levels while consumer prices are subsidized at lower levels. To the extent that rice and wheat products are consumption substitutes in the Philippines, the rice subsidies probably decrease wheat use.

In Pakistan, per capita consumption of wheat flour products is over 90 kgs, while rice consumption is only about 14 kg per capita.[14] On the other hand, rice is the food staple in Sri Lanka, Indonesia, and the Philippines. Per capita consumption of wheat flour in these low-income Asian countries is much lower than in Pakistan, ranging from about 7 kg in Indonesia to 20-30 kg in Sri Lanka and the Philippines. Per capita rice consumption, in contrast, is at least 70 kg in these three countries.

The Sri Lankan agency imports roughly equal amounts of high-protein red and low-protein (mostly white) wheats. The country's only mill mixes them together to produce

[14]Rice consumption calculated on a milled equivalent rough basis.

one standard flour, although the mill is capable of producing any type of flour. Although normally purchasing high-protein wheats, the Indonesian Government restricts production of wheat flour to only three strictly-defined types, even though the mills are also technically capable of more diversity. Wheat consumption in Pakistan is entirely of white wheat. Domestic wheat falls within a high-protein wheat class, while imported white wheat is generally of less-expensive, lower protein classes. The two types are then blended together to yield desired baking characteristics. The Philippines buys both high-protein spring wheats (and some HRW) and low-protein white wheats, for production of pan breads and noodles. The expansion of the fast-food industry in the Philippines has led to somewhat higher demand for low-protein wheats (for products like noodles, pizza, and donuts) in the last few years.

The balance-of-payments positions of these countries are generally precarious, with their debt-servicing ratios in 1988 ranging from 38 percent for Pakistan to 28 percent for Sri Lanka (Urban and others, 1992). Agricultural imports made up at least 9 percent of the total import budgets in these countries (up to 18 percent in Sri Lanka), and imports of wheat in these four countries generally tie up a large share of total agricultural imports (26-47 percent in 1988). These factors tend to lead them to emphasize greatest volume at lowest price in their purchasing habits at the expense of quality, in order to maintain domestic wheat price stability.

Key Factors in Determining Import Source

These four countries all receive wheat imports under some combination of programs from the major exporters. The net price paid and terms for the entire quantity of wheat imported are key factors in their decisions. Details of their participation in U.S. export programs are shown in table 11. Allocations and price bidding under EEP largely shape import decisions in both Sri Lanka and the Philippines, and clearly overshadow the impact of other aspects of a wheat-sourcing decision. These countries also import wheat (or flour) from other major exporters under food aid, credit programs, or for cash.

Because of the financial positions of these four countries, the net price (including the effects of subsidies and advantageous interest rates) of wheat is of great importance, and except for Indonesia, these countries buy little wheat that does not fall under at least one of these programs. Countries that buy under both concessional and commercial terms typically estimate their wheat needs and make strategic purchases to meet those needs at lowest cost. Maintaining friendly relationships with the countries that make these concessional exports is also an important consideration in import decisionmaking.

The lack of state trading and increased competition between millers in the Philippine wheat sector differentiates it from the other low-income Asian countries included in this study. These aspects make the transmission of quality preferences through prices easier than in countries the wheat sectors of which are controlled by state trading. In Pakistan, the characteristics of domestic wheat production also clearly shape quality preferences in imported wheat to match attributes in wheat produced domestically, to limit the need for blending. In all four of these countries, buyers indicate that they do place some importance on getting the best quality wheat possible at the price they pay. Protein (or gluten) quantity and quality is cited as crucial by millers (or bakers) in all four countries. Protein content is emphasized in the Philippines and Sri Lanka, where wheat is normally consumed in the form of bread, but gluten content is important even for the soft wheat used for noodles and flat bread in Indonesia and Pakistan.

Other quality characteristics mentioned as important by interviewed millers in one or more countries were moisture levels, test weight, and kernel color. Many millers in this region prefer to receive wheat within a range of moisture content that often excludes some

Table 11--Participation of sample countries in U.S. export programs

Country	P.L.-480	GSM credits	EEP
Indonesia	Yes (prior to 1989)	No	No
Pakistan[1]	Yes	Yes	Yes (since 1992)
Philippines[2]	Yes (prior to 1987)	Yes	Yes (prior to 1986)
Sri Lanka	Yes	Yes	Yes

[1]Pakistan also received in-kind wheat grants from the U.S. Agency for International Development (AID) in 1990. [2]The Philippine Government still receives wheat flour under P.L.-480.

sources of wheat because of their high-moisture content. Canadian wheat is regarded as most troublesome in this respect, and the average moisture content of U.S. wheat ranks just below Canadian wheat in this category in Pakistan. Excessive moisture content has led millers in some of these countries to feel like they are "paying wheat prices for water." In Sri Lanka and Pakistan, government importers' expectations are only that contractual limits be met.

The presence of dockage is seen as a tertiary consideration in these markets. While some participants note that U.S. wheat generally contains more dockage than Australian and Canadian wheat, it is not a major issue. In Pakistan and the Philippines, wheat screenings bring a good price in the feed market (with expense to the miller of only transportation costs from the exporting country), since the importation of corn and other feeds is restricted. In Indonesia and Sri Lanka, dockage is less important because mills are required to sell flour at controlled prices but can sell byproduct feeds for whatever the market will bear (often for export). The sale of millfeed, which contains some dockage, adds to their profit margin. If the presence of dockage (and shrunken and broken kernels) causes the flour *extraction rate* in Indonesian and Sri Lankan mills to fall below 74 percent, the losses are not covered under the administered price system and mill profits would be adversely affected. Very high levels of dockage can lower extraction rates and do incur additional transportation costs, but current levels do not present major problems in these low-income Asian countries. Moisture content is more of a concern, particularly its variability across suppliers.

The ability to purchase cleaner grain from the United States would not mean much to these importers, since for the most part their purchases are based on attaining their desired import level at the lowest total cost. Also, the United States already holds more than 70 percent of the market in the Philippines, Sri Lanka, and Pakistan. The U.S. market share has been suffering as a result of causes other than wheat quality in the Philippines, Indonesia, and Pakistan in the last few years. In the Philippines and Indonesia, Canada is actively promoting its CWRS (and discounting its price) to the millers now buying directly in the world market. In Pakistan, a decline in U.S. bilateral assistance had reduced the incentive to buy U.S. wheat, and Pakistani private traders are primarily seeking low-price wheat from nearby nontraditional exporters such as Turkey and Saudi Arabia. In cases like Pakistan, the presence of greater moisture in U.S. wheat than is found in wheat grown in Asia Minor may deter them from buying more U.S. wheat, even with less dockage.

Middle-Eastern and African Countries

The relatively low income of the countries of Africa and the Middle East requires them to pay attention to price above all when determining the source of their imported wheat. While many countries in the Middle East and Africa import a large share of the wheat they consume, only a few of them are major players in the world market. Taken together, however, the importers of the Middle East and Africa account for more than a fourth of the world's wheat imports and more than half of the world's flour imports (table 12). Six countries (Egypt, Yemen, Ghana, Togo, Tunisia, and Morocco) have been selected as representative of countries importing wheat in these two regions. These countries have relatively low per capita income levels, with all except Tunisia well below $1,000 per year. They range in wheat self-sufficiency levels from Morocco, which on average produces about 72 percent of its total domestic needs, to countries such as Togo and Ghana, with no nonexperimental domestic wheat production.

Price typically dominates all other factors in the wheat import decisionmaking process in these countries, and the government plays a role in trading in all of the countries studied. As recipients of EEP and other forms of export assistance, these countries gauge their purchases based on which program best fits into their tendering process and which exporter offers the lowest net price. Export credit is used on a scattered basis, and not at all in the Subsaharan African countries studied. Protein content is a key quality consideration in half of these countries (in Tunisia, Togo, and Ghana), and moisture content and test weight also rank high in most of them, particularly in Morocco. While maximum dockage levels are usually specified, dockage as a concern ranks high only in Togo, Ghana, and Yemen. In Togo and Ghana, cleaner U.S. wheat could lead to increased market shares for U.S. wheat or a price premium.

Major Players in Import Decisions

Wheat markets in these Middle-Eastern and African countries all include some degree of government intervention in trading. Egypt lifted its strict monopoly on state trading in 1991, but private trading is so unprofitable, given the price controls in the Egyptian wheat sector, that less than 1 percent of 1991 wheat

Table 12--African and Middle-Eastern countries, 1991 statistics

Country	Population	Wheat imports
	Millions	*Million tons*
Middle East:		
Egypt*	56.1	6.00
Iran	57.4	2.50
Iraq	19.5	2.00
Israel	6.2	.73
Jordan	3.2	.70
Kuwait	2.2	.25
Lebanon	3.4	.35
Syria	13.0	1.00
Yemen*	10.1	1.40
Africa:		
Algeria	26.3	4.00
Angola	8.8	.13
Cameroon	11.4	.15
Ethiopia	53.5	.70
Ghana*	15.7	.15
Ivory Coast	13.0	.15
Kenya	25.6	.20
Libya	4.3	.80
Mauritania	2.0	.18
Morocco*	26.2	1.65
Senegal	7.9	.15
Togo*	3.8	.10
Tunisia*	8.3	.45
Zaire	37.8	.27

*Country featured in study. Sources: U.S. Department of Commerce, Mar. 1990, and USDA/FAS, Dec. 1992 (b).

imports were private transactions. In Morocco, Tunisia, and Yemen, overall wheat demand is estimated by the government and import tenders are announced by the state trading agencies, (ONICL,[15] the Office des Céréales, and the Ministry of Supply and Trade, respectively), although domestic trading firms work with multinational grain-trading partners to meet those tenders at lowest cost, and purchase and distribute the wheat. The tenders issued in Yemen and Morocco are usually not country- or class-specific and, during the Gulf war, the Yemeni system was abandoned in favor of case-by-case transaction approval. The Ghanaian Government still handles wheat importing, but withdrew from flour distribution in 1991. The single miller in Togo handles wheat imports, but that mill is half-owned by the Togolese Government.

Yemen has one large-scale modern mill, which is privately owned but closely affiliated with a food distribution company held by the Yemeni military. The output of that large mill, the Red Sea Flour Mill, is supplemented by village wheat-grinding facilities. The mills in the other countries are mostly privately owned (with the exception of Egypt, where 90 percent of mills are owned by the government). These millers have little or no influence in selecting quality characteristics of imported wheat, although some have a role in choosing wheat classes (Ghana) or representation on the state-trading panel examining the bids (Tunisia). Yemen imports nearly 400,000 tons of flour, making it one of the world's largest flour importers, because it lacks sufficient milling capacity (additional mills are now under consideration). In contrast, some countries' milling industries are characterized by overcapitalization, such as Tunisia and Morocco, where mills operate at least 40 percent under capacity. In Yemen and Morocco, artisanal millers (small-scale, village millers) do not take ownership of the grain they mill. Rather, they perform the service for a fee. Baking is done largely in very small-scale operations in the countries studied, with home preparation of baked products still quite common in rural areas. Commercial bakeries in Morocco produce mainly for institutional use (including hotels and restaurants) and for urban residents (half of total population).

Key Factors Affecting Import Volume Decisions

Prices are controlled by the government throughout the wheat marketing system in many of these countries, both in countries with thriving domestic wheat production sectors and in those without significant domestic production. Various state agencies set the price of wheat to farmers and millers, the price of flour and some wheat products to wholesalers, processors, and consumers, and even the price of millfeed in some markets, although some wheat is traded on informal, "parallel" markets.

State traders decide the level of imports on the basis of projected consumption (and production, where it occurs). In countries with significant domestic wheat production (Egypt, Tunisia, and Morocco), some share of the

[15]Office National Interprofessionel des Céréales et des Légumineuses (National Grain and Pulse Intervention Agency).

domestic crop is procured by the government and its distribution controlled. Since 1987, such procurement is no longer mandatory in Egypt. In Yemen and Togo, consumer prices for flour and bread have government-imposed ceilings. Togo and Ghana both have import tariffs on wheat.

Wheat is the staple food consumed in the Middle-Eastern and northern African countries examined in this study, with per capita consumption of wheat flour products (including semolina from durum wheat) at least 100 kg a year. It is highest in Tunisia (also the highest seen in this study), with consumption of flour from durum and common wheat over 130 kg per person. In contrast, per capita consumption of wheat flour products in Subsaharan Africa appears to be much lower. Per capita wheat flour consumption is only 5.3 and 11.3 kg in Ghana and Togo, respectively. The main food grain in these countries is corn (accounting for more than 50 percent of total grain consumed), although millet and rice are also consumed. Nongrain crops like cassava and yams are also vital food staples in Togo and Ghana.

In the countries where wheat is produced domestically, production levels are subject to wide variations in weather and rainfall. For example, a drought in Morocco in 1992 dropped production to only about 1.4 million tons, an estimated 65-percent drop from record levels in 1991. Such swings in production cause parallel swings in import levels, as imports are planned by the state traders so as to supplement domestic production to meet estimated wheat demand. Egyptian wheat production is less erratic, because its wheat area is irrigated.

Key Factors in Determining Import Source

Price is the prime consideration for determining sources of imports in most of these countries. All of them purchase wheat under EEP, use long-term concessional loans under P.L.-480, Title I, and many also receive donations through the P.L.-480 program and other countries' food aid programs. The fact that provisions of Title I of P.L.-480 now tend to discourage long-term loans is deterring some of these countries from using their full allocations. Since all six countries are fairly low-income and most are state traders as well, they are interested in obtaining the most wheat at the best price. Credit has also been a concern in some of these countries, though their participation in U.S. and EC credit programs is often intermittent either because they no longer need it, due to increased hard currency availability (from tourism or oil revenue for Tunisia and Egypt) or debt forgiveness and cash donations (as in Egypt), or because of loan repayment problems (as in Morocco in 1990). Togo and Ghana do not use credit in their commercial wheat import transactions, largely because of difficulties with obtaining appropriate financial instruments.

Trade-servicing relationships also factor heavily in the import source decision in many of these countries, and were rated as most important in Togo. Although Togo and Ghana import the majority of their wheat from the United States, each country places some importance on maintaining competition between suppliers so U.S. traders do not become complacent. On the other hand, many Moroccan traders indicate that the EEP approval procedure is difficult for them because they must adhere to the prices already accepted by ONICL, their state trading agency. Moroccan officials and traders indicated that their long-term trade relations with French traders facilitate their acquisition of COFACE credit guarantees.[16] The COFACE arrangements with Morocco also typically cover freight costs, while GSM-103 credit for Morocco has not. Australian wheat purchased by Egypt is covered by a bilateral agreement.

The types and sources of wheat imported by these six countries vary considerably. The quality attributes of imports must complement those of domestic production when possible. For example, 95 percent of Egyptian wheat is white wheat (mostly low-protein), so they prefer to buy white wheat from other sources also. They buy around 2 million tons of Australian white wheat (which commands an $18-$20 per ton premium), but not more because they must pay world prices (although they typically negotiate some concessions from the AWB). Egyptians prefer U.S. white or HRW wheat to EC wheat because white wheat has the right color or HRW has higher protein levels than EC wheat. Nearly 95 percent of all Egyptian food use of wheat is for bread, but their preferred types of bread are made in fairly soft, flat loaves, which do not require a high-protein content. Egyptian bread consumption is shifting somewhat between types, with some young Egyptians moving away from lower quality *balady bread* toward Western-like (higher quality) *fino bread*. Yemen also buys mainly low-

[16]Compagnie Française des Assurance pour le Commerce à l'Extérieure, the state export credit corporation in France.

protein white wheat and sells much of it in 50-kg bags directly to consumers. Because of the nature of these transactions, Yemeni traders are quite sensitive to the physical appearance of imported wheat, including dockage content. They also rank Australian wheat as being of the highest quality, followed by Saudi, U.S., EC, and Turkish wheat. These rankings appear to be based mostly on wheat cleanliness.

Tunisia, Togo, and Ghana buy primarily high-protein wheats (HRS, HRW, CWRS) to produce bread-quality flour. Morocco has purchased both SRW and HRW wheat from the United States and low-protein wheat from France. In 1991, Morocco also purchased high- and low-protein wheat from Turkey and EC exporters other than France. Both Tunisia and Morocco grow durum wheat, mainly for couscous. Morocco is self-sufficient in durum production, except during droughts, while Tunisia's durum self-sufficiency ratio averages about 80 percent.

Quality typically ranks below price and trade relationships as a factor in import decisionmaking. The traders in these countries all have fairly standard contract specifications for quality. If access to trading is liberalized in the next few years as predicted in interviews in Tunisia, Morocco, and Ghana, then quality demands as expressed by millers will become more important.

Protein content is an important quality consideration in Tunisia, Togo, and Ghana, but it is not a top concern in Egypt or Yemen. Test weight is the most important quality characteristic for Moroccan buyers. Moroccan millers are concerned about protein content but have little influence in the procurement process. Egyptian traders and millers instead rank live insects/damage, moisture content, weed seeds, shrunken and broken kernels, and test weight as their key quality criteria. Although they do not rank low dockage levels as important, such factors as live insects and weed seeds would be largely eliminated by lower dockage levels. While they see wheat's physical appearance and moisture content (rejecting high moisture levels seen particularly in Canadian wheat) as important, Yemeni buyers are mostly concerned that their wheat imports satisfy the minimum quality standards in the contracts because three separate government agencies inspect imported wheat. These contracts usually contain maximum levels for dockage, foreign material, shrunken and broken kernels, and moisture, and test weight minimums in line with U.S. No. 2 standards. Tunisian millers also rank moisture content as highly important, and prefer U.S. over French wheat because French wheat usually has too high a moisture content.

The Moroccan trading agency places a great deal of importance on its minimum test weight requirement (about 60 lbs/bu), and agency officials and private importers find that U.S. SRW wheat in particular often falls below that limit. Because Moroccan millers are not given the quality data collected by the government, and they have no laboratories of their own, these millers have very little information about the quality of the wheat they obtain. The Moroccan millers are in the process of installing laboratories at the port facilities. In contrast, the Tunisian millers' union, as well as several major millers, possess (and utilize) considerable equipment for testing the quality of wheat and flour.

All of the countries studied include dockage specifications in their contracts. However, only in Subsaharan Africa does dockage appear to be the major factor in determining import source, as Togo and Ghana both find U.S. and Canadian high-protein wheat, their chief imports, to be comparable in most ways except dockage. In Egypt, Tunisia, and Morocco, the dockage level of wheat imports, including U.S. wheat, is usually below 1 percent, which is much lower than dockage levels found in domestic wheat. By providing cleaner wheat, the United States could protect its market share in Tunisia and Egypt, but would not likely achieve any other gains in those markets. Both Ghana and Togo now pay premiums for low-dockage Canadian wheat which, given past purchasing patterns and prevailing price relationships, suggests that offering cleaner U.S. wheat could narrow the price gap and lead to a higher U.S. price, by about $5/ton. Alternatively, at constant prices, the U.S. share could be increased in these markets, with a total estimated increase at 35,000 tons.

Latin American Countries

Brazil and Venezuela are two countries that have imported relatively large quantities of U.S. wheat, and can be seen as battlegrounds in which Canada and Argentina have attempted to capture market share through offering high-quality wheat or preferential trading relationships. These two countries have quite different wheat import situations, but both have recently liberalized their trade policies to become more market-oriented.

Venezuelan external debt does not constrain wheat imports to any great extent, due to an economic structure different than most other Latin American countries (stemming primarily from the availability of oil revenues). On the other hand, Brazilian external debt has seriously constrained imports in the past, and Brazil's per capita

income is a third less than that of Venezuela. Brazil and Venezuela, although both major wheat-importing countries, are not necessarily representative of importer behavior in Latin America, since they are wealthier countries than is typical in that region. These two countries do, however, account for half of Latin American wheat imports and nearly 25 percent of U.S. wheat exports into that entire region (table 13).

Both countries engage in private trading, and the state trading role in Brazil is receding in importance as the number of small-scale millers declines. The preferential arrangement (lower tariffs) between Brazil and Argentina and the lack of long-term credit arrangements with other exporters are the outstanding features in Brazil's import decisionmaking process, while quality plays the key role in Venezuela's sourcing decisions. Protein and gluten quality are ranked as the most important quality factors in both countries, although dockage (or impurities for Brazil) is also ranked high as a factor considered by importers. It appears that cleaner wheat could find a receptive market in these two countries.

Major Players in Import Decisions

Venezuelan and Brazilian import decisions are made in different ways. Since 1989, Venezuela has allowed millers/processors and private traders to import whatever quantity is desired as long as general sanitary/health standards are met and a 15-percent gross import tariff (only 10 percent for Argentina) is paid. A further specific import duty is assessed if world wheat prices get lower than domestic feed prices. This tariff is designed to protect domestic sorghum producers by keeping imported wheat out of feed channels. A second objective of the specific duty is to keep domestically produced rice and white corn competitive with wheat for food consumption. Because of relatively high world wheat prices, the specific duty is currently not imposed. Prior to liberalization, Venezuelan millers were required to obtain quotas for wheat imports.

Table 13--Major Latin American countries, 1991 statistics

Country	Population	Wheat imports
	Millions	*Million tons*
Bolivia	6.8	0.30
Brazil*	155.4	4.67
Chile	13.3	.33
Colombia	33.8	.77
Costa Rica	3.1	.14
Cuba	10.7	1.25
Ecuador	10.7	.40
El Salvador	5.4	.17
Haiti	6.3	.25
Mexico	89.8	.65
Peru	22.4	.90
Venezuela*	20.2	1.10

*Country featured in study. Sources: U.S. Department of Commerce, Mar. 1990; and USDA/FAS, Dec. 1992 (b).

The Brazilian market was liberalized in 1991 to allow private wheat imports. Prior to that time, the Brazilian Government was the sole importer of wheat. The government determined import demand based on projections of Brazilian production and consumption, and did not distribute imported wheat until mills had met their quota of domestic wheat purchases. By default, the government still acts as an importing agent for most small mills through its acquisition and release of buffer stocks. Most middle-sized and large mills import wheat from multinational trading companies. The Brazilian wheat import tariff at this time is 20 percent (although lower for imports from Argentina) while reform plans call for its phased reduction to 10 percent by 1994.[17] A general port operation tax of about $5/ton further increases the cost on non-Argentine wheat to importing agents. Argentine wheat also has a lower tariff rate in Venezuela, but the lower rate appears to play little importance.

Key Factors Affecting Import Volume Decisions

While domestic consumption levels of wheat products in Brazil and Venezuela are quite similar, their domestic production is not. Brazil produces nearly half of the wheat needed for domestic consumption, while Venezuela has virtually no domestic wheat production. Domestic wheat consumption is not currently subsidized in either country, although corn flour consumption is subsidized in Venezuela. The use of white corn flour, a substitute for

[17]A short wheat crop in Brazil induced the Brazilian Government in February 1993 to lower its tariff on non-Argentine wheat to 5 percent. The tariff on Argentine wheat became 4.8 percent as of January 1, 1993. The general port operation tax still applies differentially to non-Argentine wheat exporters.

wheat flour, reduces Venezuelan per capita food demand for wheat flour, which is still around 42 kg a year, a bit higher than Brazil's.

The Brazilian Government made an effort to become self sufficient in wheat but, in the late 1980's, the cost of approaching full wheat self-sufficiency became prohibitive, and producer subsidies were cut. The percentage of domestic consumption produced locally reached 87 percent in 1987 before declining. Current expectations are that wheat demand in both countries will continue to increase by at least the population growth rate (2-3 percent a year). However, those interviewed saw good prospects for Venezuelan wheat consumption to increase somewhat faster.

Key Factors in Determining Import Source

Both price and quality play important roles in the import decisionmaking process in these two countries, although net import price is a stronger determinant in Brazil than in Venezuela. Although both the Brazilian and Venezuelan Governments have expressed aversion to subsidized wheat imports, both countries have taken advantage of such offers when made. Landed wheat price in Brazil is a function of differential tariff rates and a long-term agreement with Argentina and its receipt of export subsidies and export credits from other exporters. Argentine wheat is exempt from Brazil's port operation tax and until 1993 was assessed an ad valorem tariff that is less than half that charged for wheat from other countries. These benefits gave Argentina a price advantage of about $15/ton over other exporters.

The preferential price relationship for Argentine wheat appears to have a strong effect on the source of private Brazilian wheat purchases, and Brazilian Government purchases are affected by the annual 2-million ton bilateral agreement with Argentina, which expires in 1995. A long-term agreement between Brazil and Canada expired in 1991, and was not renewed. The United States responded to subsidized Saudi wheat sales to Brazil with an EEP allocation in 1991. Future use of EEP in Brazil's market may be limited by a law that permits Brazil to impose countervailing duties on subsidized agricultural imports. Private traders continue to express a desire to buy under EEP. GSM transactions with Brazil have been suspended because of past repayment problems with the government, though private traders are now seeking GSM credits on their own merits. The Brazilian Government also receives export credit from Canada, although private traders are seeking longer credit terms than they now have (2-3 months).

The landed price of wheat in Venezuela is determined by the scope of its participation in the GSM and EEP programs of the United States. Venezuela once had a bilateral agreement with Argentina, but since wheat trade was privatized in 1989 it has lapsed. Venezuela is a recipient of GSM-102 credit guarantees. The guarantees do not cover all Venezuelan wheat transactions with the United States and are becoming less important. Venezuela became a recipient of EEP allocations for the first time in March 1992. In addition, Venezuelan millers place priority on reliable trade-servicing, because they maintain low inventories and prefer to have wheat delivered within 1-2 weeks.

Quality is an important factor in Venezuelan and Brazilian purchases of U.S. and Canadian wheat to mix with low-protein wheat from other sources (domestic wheat in Brazil, other imports for Venezuela) to increase the aggregate protein level of flour blends. As such, gluten strength and protein are viewed as important factors by millers in both countries. Color also ranks high as a quality factor for some Brazilian importers, and the falling number test (for detecting sprout damage) and test weight rated high in Venezuela.

Venezuela prefers high-protein wheat (hard red spring and durum) from the United States and Canada over that from Argentina because the main Argentine wheat (Trigo Pan) has comparatively lower protein content, about 12 percent. CWRS is preferred over HRS by Venezuelan millers, primarily because it exhibits less variability in key characteristics (such as gluten quality, protein quantity, dockage, test weight, and falling number) than does HRS. Wheat imported by Brazil has come from many countries in the last decade, though most of it comes from Argentina, Canada, and the United States. Over the last few years, Argentina and Canada have gained the largest shares of the Brazilian market, mostly at the expense of the U.S. share.

According to information gathered during in-country interviews and supported by examining relative conversion costs between the two wheats, the provision of cleaner (low-dockage) wheat for Venezuelan purchase could prompt up to a $5/ton premium for U.S. wheat (at 0.5-percent dockage or lower), or a 20- to 30-percent increase in U.S. imports (though market participants interviewed rated other characteristics as more important). The

willingness to pay premiums or increase imports from the United States was attributed not only to the dockage itself but also to improvements in other related quality factors in the cleaning process that tend to improve the yield and quality of the flour.

In Brazil, Canadian wheat is judged by millers to be superior to U.S. wheat in terms of cleanliness, yet the CWB apparently still at least matches U.S. wheat traders in price terms in selling No. 2 CWRS. The U.S. share in Brazil's wheat imports could rise modestly if cleaner wheat were delivered. Venezuelan millers usually buy No. 2 CWRS, but received wheat of No. 1 quality. Venezuela still commonly receives a protein bonus above minimums from the CWB, but the increment has declined in recent years. In such a situation, matching Canadian wheat in terms of dockage would go only part-way in making U.S. wheat competitive with Canadian wheat in either country. As in many other cases, for lower dockage U.S. wheat to be more attractive in these markets such wheat must also be seen as having other favorable quality factors, such as less variability in protein content and a competitive price.

Comparison of U.S. Wheat Performance and Importers' Needs

In this study, we find that some changes in U.S. export wheat quality are already occurring. The overall quality of U.S. wheat exports is improving, coming closer to dockage specifications in import contracts, but the system may need some fine-tuning to more directly address demands for wheat outside of normal specifications (for example, U.S. No. 2 or better). Importers' concern over wheat quality also extends beyond dockage to excessive quality variability and the search for intrinsic characteristics which better meet rigorous end-use requirements.

In this section, information about quality preferences and the importance of quality in making import decisions is aggregated over the wheat markets serviced by the United States. Aggregate information available from other research is also provided to supplement information collected from the individual country studies. This section constitutes an effort to define the market relationships on quality: the information on exporters' wheat quality efforts provides an indication of foreign competition for U.S. wheat, the discussion on importers' preferences is a measure of customer wheat quality demands (both discussed above), and evaluation of U.S. export data allows us to complete the picture of present U.S. export performance.

Quality Patterns in Recent Exports of U.S. Wheat

Many respondents indicated that they had seen improvement in the cleanliness of U.S. wheat exported to their country over the last few years, and data provided by FGIS lend support to this perception. In an analysis of the FGIS export inspection data for the period 1986-91 for exports of U.S. wheat, the averages for dockage, foreign material, and shrunken and broken kernels, which are factors that measure the physical cleanliness of the grain, decreased for HRS and durum wheat exports. Insignificant declines in nonmillable material are noted for HRW and white wheats (table 14).[18] Average dockage and shrunken and broken kernel content rose slightly over the period for SRW. In addition, the variability for these factors also declined in 12 of the 15 categories, suggesting greater uniformity between shipments (appendix table 4).[19] The standard deviation of shipments increased for the dockage and shrunken and broken factors for durum wheat, and the standard deviation of dockage was basically unchanged for HRS wheat over the 6-year period.

Among the 18 importers of U.S. wheat featured in this report, the same trend of improved quality holds for other characteristics, as found in FGIS data. Test weight appeared to be improved for the countries that imported U.S. durum, white, and HRS wheats, but SRW and HRW showed unchanged or even decreasing average test weight. Test weights below a certain level (about 57 lbs/bu) are often correlated with low milling yield, but benefits from acquiring wheats with test weights above 60 lbs/bu do not merit substantial premiums. The foreign material numbers for these 18 importers were consistent with the above story for all U.S. exports, with improvements for all classes but the dockage picture is more mixed, with only minor improvements in most classes.

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[18]All averages or standard deviations calculated from FGIS export data are weighted figures, weighted by size of shipment.

[19]Number of shipments by class also found in appendix table 4.

Table 14--Average quality characteristics of U.S. export wheat

Class/factor	1986	1987	1988	1989	1990	1991
			Percent content			
Hard red winter:						
Foreign material	0.32	0.32	0.29	0.29	0.31	0.23
Dockage	.67	.65	.64	.70	.71	.61
Shrunken and brokens	2.68	2.46	2.40	2.46	2.11	2.22
Hard red spring:						
Foreign material	.34	.35	.32	.31	.27	.23
Dockage	.81	.97	.83	.73	.68	.67
Shrunken and brokens	1.76	1.63	1.48	1.61	1.69	1.58
Soft red winter:						
Foreign material	.21	.23	.22	.18	.18	.17
Dockage	.76	.74	.78	.69	.79	.80
Shrunken and brokens	1.05	1.20	1.24	1.07	1.24	1.40
White:						
Foreign material	.24	.30	.24	.26	.22	.19
Dockage	.70	.64	.62	.70	.71	.68
Shrunken and brokens	1.47	1.44	1.23	1.43	1.29	1.36
Durum:						
Foreign material	.72	.47	.55	.45	.38	.20
Dockage	.83	1.06	1.17	.76	.70	.49
Shrunken and brokens	1.45	1.53	1.69	1.40	1.44	1.30

Source: USDA/FGIS, 1986-91.

Dockage fell less for durum wheat exports in table 15, because durum sales to the study countries fell in the early 1990's and were concentrated in low-income countries, which typically show less interest in acquiring low dockage levels. Moisture content also declined between 1986 and 1991 for all classes, although it fell the least for white wheat, for which moisture content averaged around 10 percent or less for all 6 years. Protein content is widely measured only for the high-protein (HRS and HRW) wheat classes, because it serves as a proxy for the amount of gluten in the wheat, which is particularly prized in such wheat. Protein content improved for both HRS and HRW wheat bought by major U.S. clients, although the average protein differential between the two classes fell from 2.2 percent to about 2 percent between 1986 and 1991. Standard deviations and sample sizes for this data are found in appendix table 5.

Contractual Quality Specifications

Most of the countries studied specified levels of certain quality characteristics in their contracts. Purchasers of high-protein wheats normally specified protein minimums (12 to 14 percent for HRS, 11.5 to 13 percent for HRW). A few countries (particularly in Asia) that import white wheat impose a contractual maximum (9 percent) on protein content. Nearly all importers specify moisture maximums ranging from 12 to 14.5 percent, and several specified minimum test weights, which sometimes differed between wheat classes.

Many factors contributed to the changes seen in U.S. wheat quality. Recent changes in U.S. laws on grain quality likely contributed to the improvement. These modifications to U.S. grades and standards included (1)

Table 15--Average quality of U.S. wheat exported to sample countries

Class	Units	1986	1987	1988	1989	1990	1991
Hard red winter:							
Test weight	Lb/bu	61.59	61.05	61.21	61.33	61.04	61.21
Dockage	Percent	.65	.62	.64	.72	.69	.61
Foreign matter	Percent	.31	.31	.29	.29	.30	.23
Moisture	Percent	11.21	11.47	11.26	10.74	11.05	11.09
Protein	Percent	12.00	11.89	11.84	12.32	12.55	12.26
Hard red spring:							
Test weight	Lb/bu	60.61	61.01	61.04	60.80	60.79	61.17
Dockage	Percent	.88	.88	.80	.77	.67	.67
Foreign matter	Percent	.32	.33	.32	.29	.28	.23
Moisture	Percent	11.81	11.68	11.80	11.49	11.61	11.41
Protein	Percent	14.17	13.34	13.24	14.61	14.66	14.29
Soft red winter:							
Test weight	Lb/bu	59.10	58.55	60.44	59.21	58.26	58.65
Dockage	Percent	.80	.80	.76	.68	.82	.81
Foreign matter	Percent	.21	.23	.21	.17	.17	.17
Moisture	Percent	13.08	12.80	12.07	12.79	12.98	12.84
White:							
Test weight	Lb/bu	60.84	61.32	61.45	61.03	60.81	61.16
Dockage	Percent	.69	.62	.62	.71	.70	.68
Foreign matter	Percent	.26	.26	.25	.25	.23	.18
Moisture	Percent	9.78	9.85	9.85	10.08	9.99	9.65
Durum:							
Test weight	Lb/bu	60.79	59.88	60.34	61.08	60.57	61.30
Dockage	Percent	.65	.62	.64	.72	.69	.61
Foreign matter	Percent	.64	.48	.46	.34	.29	.20
Moisture	Percent	12.47	11.98	11.07	9.72	11.28	10.77

Source: USDA/FGIS, 1986-91.

mandating that foreign material and dockage, once removed from the grain stream, cannot be added back in (1986), (2) requiring that wheat dockage be reported to the nearest 10th percent, whereas previously it was rounded down to the nearest half percent (1987), and (3) adopting the tighter *CU-SUM* loading procedure (1990) (*Feedstuffs*, 1990; Mercier, 1989; U.S. Congress, 1989). Another factor that contributed to the improvement in overall wheat cleanliness at export was the increasing number of wheat importers who wrote contracts with limits on cleanliness factors, particularly dockage.

All of the countries examined in this report customarily include dockage specifications in their contracts. The tightest restriction belongs to Taiwan, which incorporates a zero dockage specification and deducts the weight of the dockage plus double penalizes dockage above 0.4 percent. China deducts all dockage above 0.1 percent and penalizes dockage above 0.8 percent at a rate above and beyond weight deduction. Most countries have dockage maximums, ranging from 0.8 to 3.0 percent (all dockage weight deductible). Several others allow up to 0.5 percent without penalty, above which level all dockage is deducted by weight (table 16). Contracts for wheat imported into Brazil and Italy tend to specify levels of a factor they call impurities (which also might be defined as nonmillable material) rather than dockage alone.

Importers of U.S. wheat are becoming increasingly sophisticated in specifying contractual limits for key

Table 16--Dockage contractual specifications

Country	Level
	Percentage
Brazil[1]	1.0 nondeductible
China	.1 nondeductible
Egypt[2]	.4 nondeductible
Ghana	3.0 maximum
Indonesia	.5 nondeductible
Italy[1]	2.0 maximum
Japan	.8 maximum
Morocco	1.0 maximum
Pakistan	.5 nondeductible
Philippines	.5 nondeductible
Russia	.5 nondeductible
South Korea	1.0 maximum
Sri Lanka	.9 maximum
Taiwan	0 nondeductible
Togo	2.0 maximum
Tunisia	.8 maximum
Venezuela	1.0 maximum, .5 nondeductible
Yemen	1.2 maximum

[1]Specifications refer to impurities rather than dockage. [2]Dockage specifications for Egyptian contracts vary, ranging up to 0.8 percent nondeductible.

quality factors, particularly dockage. This does not necessarily solve the problem of excess dockage, but allows importers to penalize their trading partners when those limits are exceeded. This has led to some improvements, but contractual limits are not always being met. For example, the imposition of the zero dockage tolerance in Taiwan has forced a 29-percent decrease in average dockage in U.S. HRS wheat and an 18-percent decrease for HRW wheat shipped to Taiwan between 1986-91, but dockage in U.S. white wheat exports to Taiwan actually increased over the same period. Many U.S. traders still find it more attractive to ship wheat with moderate levels of dockage to Taiwan and pay the penalties rather than clean to zero dockage before exporting. That is consistent with the experiences of other importing countries. Some importers stated, however (particularly in European countries), that the return from financial penalties they charge for high dockage does not fully compensate them for the losses they experience, including such intangibles as damaging commercial relationships with millers and end-users in their countries. Thus, the assertion by some in the U.S. wheat industry that financial adjustments leave everyone satisfied with high levels of dockage in U.S. wheat are not validated in these instances.

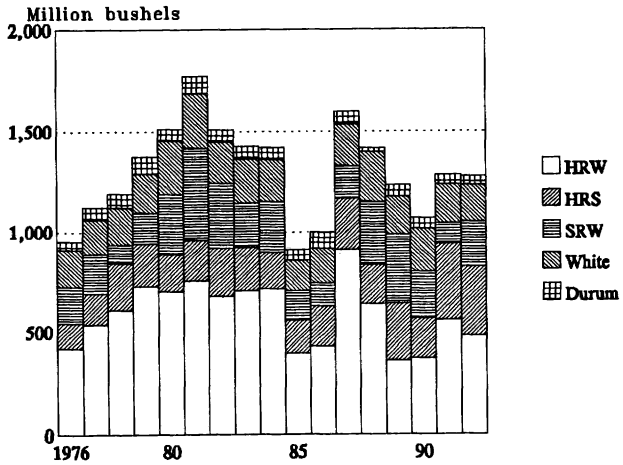
While the writing of tight contract specifications for key quality concerns would seem a straightforward solution for dealing with problems perceived in U.S. wheat quality, it appears easier to suggest such a shift than to implement it. Changing quality specifications in contracts often encounters considerable bureaucratic inertia, particularly when trading is handled by government agencies. Even when a country's imports are controlled by private traders, they must obtain agreement with all their final customers that the altered specifications would also suit their needs. A single shipload of wheat is frequently split between several ports and sometimes destined for different mills adjacent to a single port, and different specifications cannot be easily satisfied between sublots. In addition, the more complex the set of specifications within a given import tender, the fewer traders on the export side can be found who are willing to bid on such tenders. This would tend to give those amenable traders some oligopoly power in that particular market, which might tend to raise the price. For example, a contract containing maximum permitted levels for dockage is likely to attract fewer interested traders than a similar contract with nondeductible levels of dockage.

Composition of U.S. Wheat Exports

The FGIS data also illustrates two other important factors which affect the quality of U.S. wheat exports--the importance of year-to-year weather changes on quality, and the dominance of high-protein demand. The share of any given wheat class in total U.S. wheat exports in any given year seems to be more sensitive to changes in supply conditions (for example, droughts), which cause changes in quality characteristics for a given wheat class in a year, rather than to any improvements in grain quality as shown in the previous section. For example, due to poor growing conditions, the 1991/92 SRW crop generally had low test weight, low protein, and relatively high dockage. Foreign buyers became aware of the generally low quality of the new crop SRW wheat and, as a result, exports of that class fell to the lowest level in more than a decade (fig. 4).

The high-protein (hard) wheat classes, consisting of HRS and HRW, nearly always make up at least 60 percent of total U.S. wheat exports. These classes of wheat are

Figure 4
Wheat class breakdown of total U.S. exports



USDA/ERS, Nov. 1992.

demanded mostly for bread production, usually to be blended with 'weaker' domestic or other imported low-protein wheats. Only in drought years, when the supply of high-protein wheat is low, do U.S. high-protein wheat exports fall as a proportion of total U.S. wheat exports. Unlike the other wheat classes, U.S. white wheat seems to be grown primarily for export. This class of wheat is most popular in Asian and Middle Eastern countries, while only 20-25 percent of it is consumed domestically (appendix table 2). Protein content averaged 11 percent for white wheat exported to Asian countries over the last few years, but levels above 10 percent protein are often considered to be undesirable for this class of wheat, given its use in noodles, confectioneries, and flat breads, which require 'weaker' flours. Some white wheat importers have responded by placing contractual maximums on protein content.

Potential Competitor Responses to U.S. Moves To Improve Wheat Quality

Though difficult to quantify, it is important to examine potential competitor responses to any move that the United States might make to improve the quality of grain it exports. In terms of providing low-dockage wheat, Canada and Australia already achieve the standards we are considering. Responses on their part would likely be based on some other quality factor for which they have an advantage, such as quality consistency. Argentina and France, on the other hand, have chosen to not compete in that arena and would respond by altering price.

In terms of dockage, the matter most closely examined in this study, Canada and Australia extensively clean wheat in their marketing systems, and their customers report dockage of between 0.1 and 0.4 percent when it arrives. There is not much that these two countries could do to improve the cleanliness of their grain, since they have already achieved low levels of dockage. Any response to cleaner U.S. wheat would have to be based on emphasizing qualities other than low dockage (such as kernel uniformity), or an offer of quality better than sought by foreign buyers. In some quality-sensitive markets, such as Venezuela and Italy, the CWB evidently has used the delivery of wheat with protein content above contractual levels in combination with adroit price discounting as a means of securing market share.

There is some evidence that rather than continuing to concentrate solely on the low-dockage, high-protein market segments, Canada is also looking to compete in some lower quality markets. Some studies have shown that the tradeoff that Canadian wheat producers historically have experienced between high protein and high yield may have worked to their disadvantage, because protein premiums on the world market do not always outweigh losses due to lower yields (Carter and others, 1986; Veeman, 1987). Discussion is now underway in Canada on a proposal to relax the strict variety control standards and permit production of higher yielding, lower protein spring wheat varieties in certain parts of the Canadian prairies, and thus furnish wheat to some additional market segments. Another strategy by Canada and Australia could involve continuing to promote the trade-servicing advantages of their prime trading mechanisms, their wheat boards. Neither board is known to be considering changes that would lead to less cleanliness in their wheat exports.

The wheat exported by Argentina and the EC has more dockage than Canadian or Australian wheat, but both countries have the cleaning capacity to reach lower levels of dockage. Since neither marketing system (EC or Argentina) is state-run, the impetus for providing cleaner wheat would have to result from pressures on firms' export sales volumes or price differentials between competing wheats rather than as a government mandate. As long as export restitutions protect EC traders from world price changes, EC traders will not have price signals to respond to. However, the EC Commission has the capability to use some of its influence on traders to induce additional cleaning by tightening intervention

standards. Argentine traders have always faced world prices and would have to react to U.S. moves by cleaning their wheat more stringently or cutting prices, except in markets characterized by regional preferences. Argentina could also back out of the world wheat market and shift into other crops.

In each case, the competitive nature of the world wheat market suggests some response by other exporters to a cleaner-wheat strategy by the United States. Any gains captured by the U.S. wheat sector during the first year of cleaner export wheat would likely be challenged by countermoves on the parts of U.S. competitors, though their responses may not be fully successful and would be costly to them. The more dramatic the U.S. action, such as cleaning all wheat for export, the more rapid would be the competitors' response. Piecemeal adjustments would likely cause slower changes in U.S. wheat exports and also slower reactions from competitors. The scale of the responses would probably be commensurate with the size of the threat perceived to the competitors' market shares, although the Canadian and Australian Wheat Boards would likely be better equipped to make rapid changes in their marketing tactics.

Market Segmentation

Looking at world wheat trade from the point of view of a segmented market allows us to examine the potential for differential impacts on other wheat exporters and wheat importers from the United States offering a cleaner product. This approach is a natural extension of the previous emphasis on the heterogeneity of wheat classes and wheat's differentiated end-uses. The effect of competitors' responses to shifts in U.S. wheat quality depends in large part on the structure of the world market. Rather than speculate on the effects of low-dockage wheat on a single world market selling a homogeneous product, we will look instead at a hypothesis of differentiated wheat markets based on the dockage and protein content of the wheat traded in each (neglecting possible variations in other quality factors), which more accurately describes the market as it functions.

The market for low-dockage, high-protein wheat (to be called segment A) is characterized in this hypothesis by a supply curve that is quite inelastic over generally observed price ranges, and a demand curve that is also inelastic over these prices because the structure of the world marketing system (incorporated in import demand) responds sluggishly to price incentives to such wheat (for more details, see appendix B). The wheat market also contains other segments: (1) markets for high-dockage, high-protein wheat (segment B), (2) markets for high-dockage, low- to medium-protein wheat (segment C), and (3) markets for low-dockage, low- to medium-protein wheat (segment D).

The size of the U.S. marketing system and the way that the U.S. Government supports the grain industry (with income supports at the farm level and export subsidies at the export level) mean that it is generally slow to respond to incentives for low-dockage, high-protein wheat. The slow response stems in part from the fact that the U.S. system, given the signals it receives, usually does not find the financial incentives rewarding enough to merit bearing the costs of meeting the tighter requirements. Under the current system of competing bids for tenders, U.S. grain trading firms find it more profitable to concentrate on volume business rather than tailoring individual sales to quality-conscious buyers. This system includes few incentives for encouraging the exportation of low-dockage wheat.

Evidence from this study suggests that fine distinctions in quality demands for export wheat are not well communicated in the U.S. marketing system, since U.S. traders are ranked (by importers) below their competitors in efforts to service such markets. Results from the companion study on domestic wheat cleaning suggest that implicit demand for wheat quality factors, such as dockage, function fairly well for domestic use of wheat. The transmission malfunction that appears in the export market could be arising from an imperfect market in information, because an asymmetry in information about specific grain quality exists between domestic and foreign buyers that the U.S. system does not adequately address.

Domestic grain buyers generally use their proximity to the production point to acquire information about the end-use characteristics of the grain and use it more efficiently than foreign buyers because (1) domestic purchases can be and are more concentrated geographically and (2) the grain is handled and commingled more before reaching foreign mills than is true in the domestic setting. In effect, it is easier for domestic buyers to maintain the grain's identity from the point of production to the point of use than it is for foreign buyers. Some public and private efforts have been made to disseminate U.S. crop quality information abroad to ease this asymmetry (USDA/FGIS, 1987-90; U.S. Wheat Associates, 1992).

Effect of U.S. Commodity Programs on U.S. Wheat Quality

Many aspects of the U.S. commodity programs tend to encourage farmers to emphasize crop yield over crop quality. In the mid-1980's, U.S. wheat producers could enter their grain into government stockholding programs for payments (nonrecourse loans or Farmer-Owned-Reserve) without suffering market-based discounts on lower quality grain.

One domestic remedy has been to provide end-use based premium and discount schedules for grain entering government programs, so the government does not always serve as the chief outlet for low-quality grain. USDA regulations currently call for assessing discounts based on some quality factors (dockage, heat-damaged kernels, total damaged kernels, moisture, test weight, and protein content for HRS and HRW), based on commercial discounts prevailing in the previous year (USDA/Commodity Credit Corporation, 1992). Other changes have been adopted discouraging movement of low-quality grain into government stocks. These aspects have not been major factors since activated, however, since the low level of wheat stocks and high market prices have precluded much grain forfeiture.

U.S. Government programs also tend to encourage farmers to achieve high yield rather than maintain consistent quality attributes. For example, the target price for wheat, set at $4.00/bu, in effect guarantees farmers a given return for a significant portion of their crop regardless of market conditions or the crop's quality. The freezing of program yields that occurred with the 1985 Food Security Act reduced the incentive of farmers to continue boosting yields at the expense of all other factors, but no aspect of U.S. programs explicitly encourages U.S. farmers to seek to enhance the quality of their grain.

Millers in countries with ample domestic supplies and free markets purchase grain at *first-handler* elevators or even contract with individual producers to ensure uniform quality, a luxury few large-scale importers can afford. Although most importers are very knowledgeable about the quality of the wheat crop in its source countries in a given year (even down to crops in individual States or Provinces), it would be very costly in terms of transaction and monitoring costs for a miller in one country to contract directly with country elevators or producers in another country. Thus, all else being equal, foreign users of grain from a given source are more likely to receive a wider variation of grain quality than domestic users. The Canadian and Australian Governments have already established significant policy measures and institutions, including the use of state trading agencies, variety release controls, and mandated cleaning for export to alleviate the problems that this information cost gap causes, giving them a competitive advantage in this respect.

The U.S. grain marketing system, though privately owned and operated, plays the same role as the Canadian and Australian boards in communicating quality preferences from the importers who use the grain to the farmers who produce it. The Canadian and Australian systems may actually overemphasize the quality dimension in the market signals transmitted to their farmers. In a perfectly competitive market, U.S. grain traders would fulfill the function of relaying market signals. However, the presence of U.S. Government programs are suggested to have created obstacles to the flow of information and otherwise smooth functioning of the market (see box). Our domestic study suggests that premiums offered in the U.S. domestic market, such as for higher levels of protein or lower levels of dockage, do not generally offset the higher costs (in terms of yield loss or cleaning costs) to the farmers who might seek such premiums.

This is not to say that no information about the composition of wheat import demand is being transmitted

through the U.S. marketing system. For example, some farmers in California and the Pacific Northwest are responding to demands for hard white wheat by expanding area in that class and trying new varieties. Similarly, some elevators in the Pacific Northwest are measuring protein levels in white wheat and segregating where appropriate in storage and transportation. The means of transmitting such information clearly exists, but apparently the signals about low-dockage wheat have been conveyed in such a way that market participants are not convinced about the permanence of such demand.

Canada and Australia, through the operation of their wheat boards, have been able to respond to preferences for high-protein, low-dockage wheat, while the U.S. system is less responsive to price differentials or other indicators of demand for quality characteristics. Some limited efforts by quality-sensitive importers to stipulate high-quality specifications in U.S.-origin contracts have been revealed in the course of this study. However, either the prices offered by U.S. exporters to complete such deals have been seen as prohibitively high (particularly in relation to prices offered by Canada and Australia) or importers have been dissatisfied with results (for example, complaints were relayed of major sublots of shipments to Italy and Philippines not meeting contractual specifications). In the past, U.S. traders have usually been reluctant to pursue such initiatives, either because they regard the premiums as too small or because such wheat cannot be easily obtained in the pipeline of the marketing system. However, evidence from this study suggests that in order to recapture market share from Canada or Australia (in market segments A and D), the United States would have to match them in terms of cleanliness, and continue to prevail with the use of mechanisms such as export subsidies, lower transportation costs, or easier credit terms.

The functioning of the EC system in some respects parallels the structure of the U.S. system. In the CAP, policies also obscure changes in world prices and traders are not particularly sensitive to quality-specific demands for wheat in limited export markets. The EC's wheat thus also suffers in comparison with Canadian and Australian wheat in terms of quality. In recent years, the EC has been unable to sell all of its exportable surplus of wheat and has been accumulating large carryover stocks. With the EC intervention system functioning to accumulate large stocks over the last few years, the EC is also beginning to fill a role as a residual supplier (previously held by the United States in the 1980's) and seems to primarily serve importers who are not highly quality-conscious. U.S. policies about stockholding, which resulted in huge stocks in the mid-1980's, have been evolving in the last two farm acts to place more emphasis on disposing of government stocks (through wheat auctions and use of generic certificates). In the markets in which the United States competes head-to-head with the EC and Argentina (primarily segments B and C), providing wheat with even lower levels of dockage and equivalent prices might allow the United States to capture more of those markets, if U.S. traders are so inclined. However, higher costs to the U.S. wheat sector in the form of cleaning costs would probably prevent U.S. traders from offering equivalent prices. The bias of the Canadian and Australian systems toward serving quality-conscious importers occasionally forces them to sell high-quality wheat to less quality-conscious markets that do not award it price premiums. As in all market segments, gains by the United States will be tempered by responses by competing exporters.

Mandating the cleaning of all wheat could leave the United States competing on equal terms in only two of the four markets (segments A and D) and could leave other import markets (market segments B and C) to be dominated by countries selling high-dockage wheat at bargain prices. The segmented market would effectively cause U.S. traders to sell low-dockage wheat into those high-dockage markets at the same price that EC or Argentine high-dockage wheat is bringing, or face loss of exports. Canada and Australia already experience this dilemma to some degree, although with their limited export capacity it is not too big a problem. The increased availability of low-dockage wheat would result in sales to low-income countries without receipt of a premium. In such a case, U.S. exporters could gain modestly in some markets that display some quality sensitivity, but give away quality to buyers unable or unwilling to pay for it.

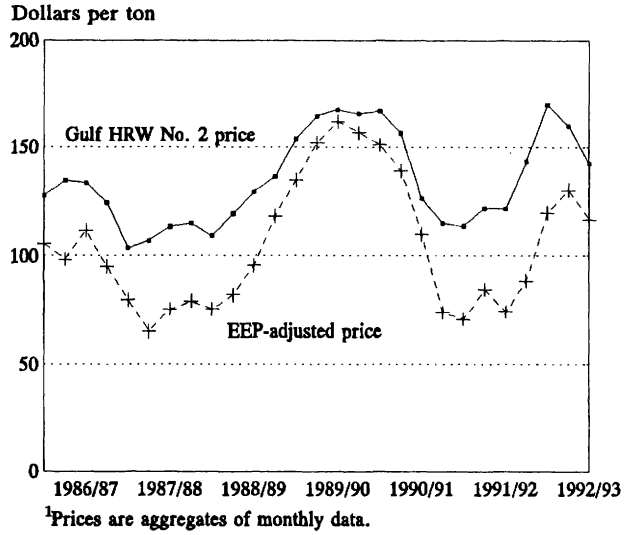
The world wheat market can also be segmented by factors other than demand for various quality characteristics. Wilson and co-authors showed that the differentiation of world market prices increased markedly since the early 1970's (1989(b) and 1992). The heavy presence of export subsidies, export credits, and food aid programs has caused various importers to pay widely different prices for similar lots of wheat. Only a relatively small portion of the wheat market, primarily the developed countries in Europe and Asia (EC, other Western Europe, Japan, Taiwan, Hong Kong, Singapore), pay unsubsidized prices. EC importers of wheat from outside the Community pay a levy on top of the commercial price. These countries, plus South Korea, which receives some export credit

assistance, accounted for under 15 percent of world wheat trade in 1991/92.[20] Countries that are beneficiaries of the export subsidy competition between the United States and the EC have at times received discounts of up to 40 percent from the prevailing world price (gulf f.o.b. price for U.S. No. 2 HRW wheat; see fig. 5).

Other countries receive wheat under export credit or food aid programs; credit sales sometimes overlap in coverage with wheat shipped under the EEP. The GSM credit guarantee programs permit importers who are poor commercial credit risks to borrow money from banks (both U.S. and foreign-owned) that they would not otherwise be loaned. Countries that receive wheat under Title I of the P.L.-480 program borrow from the U.S. Government and receive long-term, low-interest credit (Ackerman and Smith, 1990). One study examined the combined price discrimination effects of U.S. export programs (EEP, GSM credits, P.L.-480) on U.S. export customers, but did not separate the effects (Skully, 1992).

Both of these credit programs (GSM and P.L.-480, Title I), and similar programs conducted by other countries, also effectively lower the price paid for a ton of wheat. There is ample evidence to suggest, both from our country case studies and previous analyses, that the differences in net price caused by these factors have a great deal more impact on import decisionmaking than do quality factors. If the role of subsidies were reduced in the world market, it appears likely that the role of quality would become more prominent. It is probably not a coincidence that the more quality-conscious markets, even among developing countries, are those in which export subsidies or other programs play only minor roles.

Figure 5
Segmented world wheat market: Gulf HRW versus EEP-adjusted price[1]



[1]Prices are aggregates of monthly data.

Implications

This study examined the role of quality in the import decisionmaking process in the world wheat market to determine whether it would be of net benefit for the United States to offer cleaner grain on the world market. Cleanliness was ranked behind intrinsic characteristics by most interviewees in terms of affecting import decisionmaking. We will examine the dockage aspect of this question based on the evidence assembled, and suggest potential strategies for expanding U.S. exports of wheat based on the sale of cleaner wheat. Of course, in many cases, it is likely that U.S. wheat exports must be cleaner simply to maintain the U.S. share of markets in many countries. We will also examine a few implications of the broader demands for wheat quality in imports.

Would the Availability of Cleaner U.S. Wheat Help the U.S. Wheat Export Position?

Unless the U.S. wheat sector continues to improve cleanliness, including factors such as dockage, the United States may well experience a slight decline in its share of the world market over the next few years, all other factors being equal (such as levels of export subsidies and export credits). Actions, such as mandating the cleaning of grain for export or incorporating dockage as a *grade-determining factor* might serve to maintain or even increase U.S. market share in a few quality-sensitive markets, such as Venezuela, China, Italy, and Togo. Our study shows that if all U.S. exported wheat were cleaned before shipping, U.S. exports may be modestly enhanced over current levels in selected high-protein/low-dockage markets in high- or middle-income countries. However, this modest increase in U.S. exports in these limited markets could conceivably be offset by losses of exports in more price-sensitive markets if the price of U.S. wheat increases due to the increased cost from cleaning. An additional set of offsetting factors are responses (probably price-related) expected from the U.S.'s major

[20]This figure excludes intra-EC trade.

competitors, although the exact scope of those responses is unclear. These two factors could combine to overwhelm the gains in the quality-sensitive markets, suggesting that mandating cleaning of all export wheat would probably be a losing proposition. Other strategies involving less exhaustive cleaning and more efficient marketing could reap some benefits.

Quantity Adjustments

A handful of countries were identified in this study as potentially expanding imports of U.S. wheat by 400,000-700,000 tons if dockage levels were lowered, amounting to only a fraction of the current U.S. wheat export market. Within the study's sample, Italy, Venezuela, Togo, and Ghana (and Brazil and China, although price remains their key criteria) were identified as being willing to expand imports of U.S. wheat if cleaner wheat were available. These markets represent more than one-third of U.S. wheat exports in a typical year. Current U.S. market shares are listed in table 6. The potential shifts in U.S. exports into these countries are shown in table 7. Taking the stated ranges of expansion of U.S. exports and calculating average U.S. exports into those markets over the last 5 years, our research suggests that annual U.S. exports of wheat could potentially expand total U.S. wheat exports by 1 to 2 percent as a result of delivering cleaner wheat at current prices.[21]

Many countries that import U.S. wheat were not directly covered in this study, but only a few of them (chiefly in Western Europe) are likely to respond to cleaner U.S. wheat by expanding imports. Respondents could be exaggerating somewhat in their estimated impacts, particularly if world prices were to go higher, but taking the mid-point of this range could still yield a net gain of around 560,000 tons of U.S. wheat exports (20 million bushels). If world prices go much higher than current levels, then the market tends to become more of a seller's market, and most countries would be forced to be less discriminating in their import selections. At current cash costs of production, a 560,000-ton increase in exports would yield a net increase in farm revenue of about $25 million for 1992.[22] Cleaning the other 32 million tons of U.S. wheat exported would cost nearly $19 million, mostly offsetting that figure. A small increase in U.S. exports would likely require a minor price increase at the farm level, perhaps $0.75-$1.50/ton ($0.02-$0.04/bu), in order to pull milling-quality wheat out of domestic consumption or induce a small increase in area planted.[23] This minor price increase on the domestic market would tend to offset the slightly higher costs incurred from cleaning the wheat (estimated at about $0.02/bu)(Hyberg and others, 1993). The higher market receipts would be mostly offset by decreases in deficiency payments made. This domestic price increase would likely be only partially transmitted to the world market, as rival exporters would attempt to counter U.S. moves and average export subsidies would rise as a result. The small increase in the export price would probably be experienced fully only in the unsubsidized import markets. There is no indication that the moves toward cleaner grain contemplated by the United States would actually increase or decrease world wheat trade volume. The importers interviewed also indicated little, if any, willingness to pay higher prices for cleaner grain. Many already have cleaning capacity in place--and hence can do their own cleaning if necessary--and view dockage as a negative point in what is typically a buyer's, rather than a seller's, market. World export demand is largely saturated, given the large exporter subsidies in general use, and quality would tend to influence the source of grain far more than how much is bought.

At the same time, some markets appear to be indifferent to the offer of cleaner grain, and could well switch their business to other exporters or elicit higher EEP bonuses if low-dockage U.S. wheat were to carry even a marginally higher price. Even just a 5-percent decline in U.S. export share in these generally developing countries (such as Morocco, Pakistan, and the Philippines in this study) that are indifferent to low-dockage wheat but sensitive to price could either reduce U.S. exports by more than 500,000 tons or induce the United States to offer higher EEP bonuses in order to maintain market share.

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[21]While CEROILS representatives cited a range of increases in U.S. exports as a result of cleaner wheat from 1 to 30 percent, most other sources found more modest import expansions to be more likely. For the purposes of this analysis, we postulated a range of 1.5 to 4.0 percent for a Chinese increase of U.S. wheat imports, or 100,000-250,000 tons. While the reliability of this aggregate export gain number is subject to some question, the firmness of responses suggests that gains in these markets would occur.

[22]Using 1992 figures from the summer 1992 USDA baseline, we calculated net return over cash costs of production for about 560,000 tons of wheat. This process incorporated an average yield of 35.4 bu/acre, cash costs of production of $82/acre, and a season's average price of $3.45/bu. Net costs of actually cleaning the wheat are estimated at $0.0165/bushel. An increase of 700,000 tons would yield increased farm revenue of $32 million.

[23]These results are drawn from a run of a U.S. wheat baseline model, shocking the U.S. wheat sector with a 560,000-ton export increase.

Changes in the composition of U.S. exports would thus come at the expense of other exporters, and much, if not all, of the cost of added cleaning would have to be borne in the U.S. grain production/marketing system or within the Federal budget (in the form of higher EEP bonuses). The need to clean wheat without receiving appreciably higher prices could eventually drive a few marginal wheat farmers/elevators out of business. If competitors strive to recapture lost market share, this export volume gain in limited markets resulting from cleaner U.S. wheat could decline somewhat after a few years. The adoption of such a strategy in the interim would benefit the U.S. wheat sector in terms of increased purchases of agricultural inputs, slightly higher throughput in the elevators, and increased costs on U.S. competitors. Combining the results from both quality-sensitive and price-sensitive markets, we found that losses in U.S. exports in the price-conscious markets could more than offset the gains seen in the few quality-conscious markets.

Price Adjustments

The possibility of paying premiums for cleaner wheat was raised in interviews in a few countries (Japan, Venezuela, Philippines, Italy, Togo, and Ghana). Amounts mentioned were usually modest, in the range of $1-$6 per ton. Even though the world wheat market is represented in this study as one of differentiated products, most relative premiums that might be awarded would eventually be eroded by competitors' lowering their prices in an effort to recapture lost market share. Premiums for cleaner U.S. wheat are likely to persist only in markets in which U.S. (and other low-dockage) exporters succeed in convincing buyers that paying more for such wheat is more profitable in the long run than paying lower prices for high-dockage wheat. An objective assessment of the value-added amount obtained from low-dockage wheat as compared with high-dockage wheat can support the paying of such premiums (see Venezuelan case study for details).

Canada and Australia have a certain amount of wheat with which they can compete for the premium markets, but their production capacity is more limited than that of the United States. However, the ability to produce large amounts of wheat that can be cleaned to satisfy low-dockage markets will tend to make such wheat a more abundant commodity and importers will not have to pay extra to receive it. Offering additional quantities of clean wheat would place pressure on such premiums, to the detriment of Canada and Australia. If the countries that suggested such a willingness actually paid a modest premium for all the U.S. wheat they import (using middle of premium ranges when necessary), it would amount to about $13 million in additional export revenue in the first year, and probably diminish thereafter.[24]

The benefits from offering cleaner wheat cannot simply be added across the two categories just discussed. Instead, we must evaluate which countries would actually expand imports of U.S. wheat if faced with paying a premium for the cleaner product. In this combined scenario, the benefits from expanded exports shrink considerably, to less than 200,000 tons. This reduces the net benefit from greater exports to about $2 million, with total benefit from the export sector of $15 million. This amount fails to offset the net costs of cleaning all U.S. export wheat, determined to be at least $23 million per year.

Would Offering Cleaner Wheat to Only Quality-Conscious Markets Be More Efficient?

It might actually better serve U.S. interests to not offer cleaner grain across the board but export more effectively between customers, such as those in quality-conscious markets. The optimal approach could be to create incentives for the U.S. marketing system to differentiate and target the cleaner wheat to markets already identified as receptive to paying for it. Cleaning selectively at the country or subterminal elevator level and segregating that wheat through the marketing stream could reap the export benefits offered by cleaner grain in few markets that clearly prefer low-dockage wheat, but not incur the costs of cleaning all wheat. Targeting clean wheat to the markets identified above could reap benefits of $7-$9 million to the U.S. wheat sector. Such an action would reduce the need to clean wheat to those regions and ports which produce and export the desired wheat classes to those destinations. Cleaning dockage from wheat often reduces problems that importers experience with pesticide residues, insect damage, and noxious weed seeds.

Cleaning all U.S. wheat to low dockage levels to offer to all importers might increase the world supply of clean wheat enough to reduce the premiums such wheat now receives. Such an action would raise U.S. marketing costs. This situation appears to take on some features of

[24]For purposes of estimation, the willingness of importers in Japan and the Philippines to pay premiums, but not detailing actual amounts, was assumed to imply a willingness to pay about $1/ton for cleaner wheat. Respondents in Ghana and Togo indicate willingness to buy more wheat or pay a premium for cleaner wheat. For this analysis, we selected the first option.

a free-rider problem, since the countries that have not expressed a desire for cleaner grain will still get a lower dockage product and the countries buying the extra U.S. wheat or paying the premiums will bear an added burden.

The impact of selectively offering cleaner wheat could well be enhanced in the next 3-5 years by the loosening of state controls over grain trading in several countries that are currently contemplating such an action, including China, Russia, Taiwan, Ghana, Morocco, and Tunisia. Quality could become more of a determining factor in the wheat trade as well if the Uruguay Round of the General Agreement on Tariffs and Trade (GATT) is completed successfully. A GATT agreement along the lines agreed to between the United States and the EC in November 1992 would cut back the use of export subsidies in the world wheat market by 21 percent by the year 2000. This could initially reduce wheat imports by some developing countries but fewer export subsidies could reduce the interference of pricing segmentation (through subsidies, credit, and other measures) and raise the importance of quality as a purchasing decision factor, that cleaner U.S. wheat could exploit. A GATT agreement containing rules on harmonizing phytosanitary regulations could also reduce the temptation to use phytosanitary rules on wheat imports as nontariff trade barriers.

The market segments that demand cleaner wheat could well expand over time. On top of the possibilities offered through trade liberalization (both multilateral (GATT) and unilateral), other factors that could contribute to increased demand for such wheat include income growth and increasing concerns expressed internationally about food safety. In addition, increasing sophistication and automation of milling and baking technologies will require increasingly specific contracts to acquire the appropriate wheats. This last factor would undoubtedly affect demand for quality factors in addition to low dockage levels.

Of course, wheat cleanliness is only one aspect of the quality issue, and a factor that was not deemed preeminent by most of the respondents interviewed. Such concerns as protein and gluten quality were seen as more crucial and contributed more to importers' decisionmaking since these factors are directly related to end-use performance. This ranking of factors suggests an interesting dilemma; on the one hand, dockage is a much less crucial problem to most importers than are problems with protein or gluten. On the other hand, we already possess the technology to address the dockage problem, while problems with protein, although the subject of intensive ongoing research, have not yet been solved. Thus, it may yet become a question of where the best return to money invested would occur: attacking the dockage problem with already available technology, or addressing the protein problem with anticipated payoff in increased revenue well into the future.

Improvements in these intrinsic factors would have to arise from another part of the U.S. wheat system. In fact, addressing such concerns as protein variability could require an integrated response from several parts of the entire U.S. marketing system. Of course, not all market participants would be directly affected by the changes occurring, since specialization would likely occur. These factors represent concerns expressed not only by importers but also by domestic millers (Marten, 1992). Solutions could include, but not be limited to, imposing controls in the plant breeding area and providing means to preserve variety identification. Variability of quality both within and between shipments was another concern, which could be addressed by modifying transport and loading procedures and tightening grading standards. This study implies that enhancing some of the intrinsic characteristics of U.S. wheat might find a greater return in the world market than would lower dockage wheat, although such a result is not established empirically.

Conclusions

Factors such as credit, export subsidies, quality, and bilateral arrangements all seemed to have played roles in the challenge to the U.S. wheat export position. The importance of quality varies, depending on the market, with the high-income, nonsubsidized markets generally more sensitive to quality in making import decisions. Freer import markets, in which end-users have a direct voice in determining contract specifications, also seem to be more sensitive to the quality of the wheat they import.

Mandating cleaner wheat could create losses of at least $8 million for the U.S. wheat sector, but alternative scenarios such as targeting markets with demand for low-dockage wheat may achieve net benefits, with lower marketing and/or production costs to the U.S. wheat sector and without loss of exports in less quality-conscious but price-sensitive markets. This selective targeting would require overcoming the perceived existence of imperfect information transmission, which is partly due to the structure of U.S. commodity programs. These programs tend to shield farmers and traders from the full effect of world price variations. Promoting cleaner U.S.

wheat for export would be aimed more at those markets now served primarily by Canada and Australia, and would have less of an impact on wheat exports by the EC and Argentina. In the seven dockage-sensitive markets discussed above, Australia and Canada held more than a third of the total market share, while the EC and Argentina held less than half that share. The U.S. share of those same markets was 45 percent during 1988-90.

Addressing wheat quality as an issue more broadly than cleanliness would involve more participants in the reform process, and could also generate greater results. Trade liberalization, if it occurs, would likely clarify and enhance the role of wheat quality in import decisionmaking. It is clear that improving the quality of wheat to be supplied cannot be addressed solely in terms of altering U.S. grain grades and standards. Instead, solving the problem demands viewing grain quality in the context of an integrated U.S. wheat production and marketing system. The entire system affects grain quality, so an efficient solution would influence the whole system. The most cost-effective strategy to take advantage of quality-sensitive import markets would likely involve changes all along the marketing system. None of these changes would be drastic in isolation, such as cooperatives encouraging members to plant the high-protein variety among roughly equal-yielding varieties or some elevators making more of an effort to segregate on the basis of end-use factors. However, the sum of such changes could produce a system ready to challenge Canada and Australia in order to recapture market share in the potentially lucrative high-quality markets without significantly hampering the flexibility that currently characterizes the U.S. wheat marketing system.

Glossary

Alveograph--A graph that measures gluten strength of wheat flour and dough.

Amylograph--A test that examines bread dough viscosity.

Ash content--The mineral content in the wheat drawn from the soil or fertilizer.

Balady bread--A popular bread made from coarsely ground flour (82-percent extraction rate) in Egypt.

Blending--The systematic combining of two or more lots or kinds of grains to obtain a uniform mixture to meet a desired specification.

C & f--Cost and freight to the designated delivery point, paid by the seller.

C.i.f.--Cost, insurance, and freight to the designated delivery point, paid by the seller.

CEROILS--China National Cereals, Oils, and Foodstuffs Import and Export Corporation, the sole Chinese grain marketing agency.

Cu-Sum--A set of rules established by FGIS, which must be followed when loading grain on ocean vessels for export. The rules control variability among sublots blended to meet contract grade limits.

Defects--Computed total amount of damaged kernels, foreign material, and shrunken and broken kernels.

Dockage--Nongrain material that can be readily removed by accepted mechanical screening devices.

Dough tests--Tests that are used to test the elastic and plastic qualities of dough. Commonly used dough test equipment include the alveograph (Chopin) and the farinograph (Extensograph). The measure yielded by these dough tests is quoted in terms of a "W" factor.

Export (or terminal) elevator--An establishment that operates facilities for receiving and shipping grains in large quantities at a terminal market. These locations were frequently the final destination of much of the grain because these were often important locations for processing, hence the designation terminal.

Extraction rate--The fraction of the wheat kernel that is converted into flour during the milling process. This rate is typically 74-75 percent in U.S. flour mills.

Falling number test--A test used to measure sprout damage in wheat.

Farinographs--A measure used for determining water-carrying capacity of the dough.

Fino bread--A type of bread made from finely ground flour (72-percent extraction rate) in Egypt, which is similar in texture and taste to French bread.

First handler--A merchant or processor who buys grain directly from farmers; usually the country elevator.

F.o.b.--Free on board, specifies that the seller loads the ship or other conveyance at the specified delivery point, with the buyer paying freight charges.

Foreign material--Nonwheat material of similar size and weight to wheat kernels.

Gluten--A tenacious, elastic substance found especially in wheat flour that gives cohesiveness to dough.

Grade factor or grade determining factor--Those characteristics of grain used to determine the numerical grade. The grade factor is based on quantitative limits (either maximums or minimums) placed on each factor for each grade.

Identity preservation--Segregation of a commodity from one point to the next in the marketing system. The initially identified commodity is delivered to the next point in the marketing system without being mixed with other units of the same commodity during handling and shipment.

Intrinsic value (or end-use value)--Characteristics critical to the end-use of grain. These are nonvisual and can only be determined by analytical tests. For example, the intrinsic quality of wheat is determined by characteristics such as protein, ash, and gluten content.

Market channels--The agencies and institutions through which products are moved from their original producers to the final consumers in the marketing of grain. The market channel includes all of the stages from the point of first delivery from the farm to the final consumer of raw or processed products.

Moisture content--The amount of water in grain; measured by the weight of water as a percentage of the total weight of the grain including water.

Niche wheat--Wheat that is imported to meet very specific end-use demands, for high-quality food products.

Screenings--The material removed from grain by means of mechanical sizing devices; generally include broken grain as well as nongrain material removed on the basis of density or particle size with mechanical cleaners.

Semolina--A coarse separation of endosperm extracted from durum wheat to make pasta.

Shrunken and broken kernels--All matter that passes through a 0.064 inch by 3/8 inch oblong-hole sieve.

Sprout damage--Involves high-moisture wheat kernels that germinate prematurely. Sprout damage to wheat kernels increases alpha-amylase activity in the flour, which retards the ability of the flour to thicken, which is important in most baked goods.

Subterminal elevator--An establishment that buys and sells grain in large quantities, and operates facilities not located at a terminal market for receiving and shipping grain. The majority of grain is received from other elevators rather than from farmers. May be inland or river ports.

TCK smut (also known as dwarf bunt)--A wheat fungal disease (Telletia Controversa Kühn) which infects wheat but also poorly cleaned grain storage facilities. This disease occurs in the Pacific Northwest of the United States, and is of particular concern to Asian wheat importers.

Terminal market--A major assembly and trading point for a commodity. Some of the major U.S. terminal markets for grain are Kansas City, Chicago, Minneapolis, Toledo, Portland, St. Louis, New Orleans, and Houston.

Test weight--Weight per unit volume as measured in pounds per bushel as defined in the United States. Determined by weighing the quantity of grain required to fill a 1-quart container. The international equivalent measure is kilograms per hectoliter (conversion factor 0.77).

Vital wheat gluten--Consists of about 75 percent protein, and can be used to fortify wheat rather than blending high-protein and low-protein wheats. It is obtained by 'washing' a dough of wheat flour and water, but must be kept at stable, low temperatures or its utility is limited.

Vitreous kernels--Hard, high-protein kernels.

Zeleny test--A test which measures the dough handling properties of wheat flour. This measure is used widely in Europe. The measure is also known as the wheat sedimentation value.

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Appendix A: Details of Exporters' Wheat Sectors

The world wheat market is virtually controlled by five countries, which differ considerably in the scope of their production sectors and the extent of governmental intervention. The common thread these countries have is a comparative advantage in the production of wheat and a resulting pattern of producing more than can be consumed domestically, so they seek to sell their surplus wheat on the world market.

The United States

The United States, in addition to being the largest wheat exporter in the world, also produces the widest variety of classes of wheat. U.S. wheat producers grow five distinct classes of wheat: hard red spring (HRS), hard red winter (HRW), soft red winter (SRW), durum, and white (both soft and hard) wheats.[25] The hard wheat classes (durum, HRW, HRS), tend to be relatively low-yielding, high-protein wheats, and SRW and white wheat are generally low-protein, higher yielding, which gives U.S. customers a wide selection of wheats and resulting qualities (app. table 1). Within a given wheat class, a farmer has many varieties with different intrinsic characteristics from which to choose to plant. The U.S. system does not concentrate on providing uniform product quality, as do the systems of some other major exporting countries.

U.S. Marketing System

The assortment of U.S. wheat classes produced is a function not only of the climatic diversity found in the United States but also of the multitude of different wheat products demanded by U.S. consumers. Domestic food use of U.S. wheat is typically 20-22 million tons (735-800

[25]Hard red spring wheat is sometimes characterized in import contracts as dark northern spring (DNS) or northern spring wheat (NS). DNS is a subclass of HRS wheat which contains at least 75 percent dark, hard, and *vitreous kernels*, which are higher in protein. NS is another subclass of HRS wheat that contains between 25 and 74 percent dark, hard, and vitreous kernels. U.S. durum wheat also has subclasses, which are sometimes specified in contracts. Hard amber durum wheat (HAD) is a subclass of durum containing 75 percent or more hard and vitreous kernels of amber color. Amber durum wheat has between 60 and 74 percent hard and vitreous kernels of amber color (U.S. Congress, 1989).

Appendix table 1--Average yields and protein contents for U.S. wheat

Class	Units	1987	1988	1989	1990	1991[1]
Hard red winter:						
Yield	Bushels/acre	35.7	32.9	27.2	36.8	33.0
Protein	Percent	11.7	11.9	12.5	12.2	12.6
Hard red spring:						
Yield	Bushels/acre	33.1	17.9	27.4	36.1	31.9
Protein	Percent	13.9	14.7	14.6	14.2	14.5
Soft red winter:						
Yield	Bushels/acre	46.0	49.2	45.8	42.9	34.4
Protein	Percent	9.7	NA	10.1	10.4	10.4
White:						
Yield[2]	Bushels/acre	61.6	60.9	55.8	62.3	52.3
Protein	Percent	10.2	11.3	11.6	10.5	11.4
Durum:						
Yield	Bushels/acre	28.1	15.8	25.1	34.9	32.5
Protein	Percent	13.4	14.0	14.7	13.1	14.0

NA= Not available. [1]FGIS ceased publication of domestic wheat quality data in 1990. [2]More than 70 percent of wheat grown in the Pacific Northwest and California is irrigated (mostly white wheat) (U.S. Dept. of Commerce, Bureau of Census, May 1990).
Sources: USDA/ERS, Nov. 1992; USDA/FGIS, 1987-90; and U.S. Wheat Associates, 1992.

million bushels),[26] or about 33 percent of total disappearance (USDA, World Agricultural Outlook Board, Dec. 1992). Americans consumed more than 65 kg (138 pounds) of wheat flour products per capita in 1991, with breads (23 kg), rolls (10.6 kg), dry pasta (6.3 kg), cookies (6.1 kg), crackers (4.0 kg), sweet yeast baked goods (2.0 kg), cold cereals (1.9 kg) and bagels (1.6 kg) as the major categories. This assortment reflects the cultural diversity of the United States, and requires many types and qualities of wheats to meet the end-use demands (Putnam and Allshouse, 1991; U.S. Dept. of Commerce, International Trade Administration, 1992).

The ratio of wheat exported to wheat produced differs between the classes (app. table 2). Over the last 5 years, more than 80 percent of white wheat production has been exported, while only 50 percent of SRW wheat produced has been exported. About 60 percent of the other three major classes is exported. Of the U.S. wheat inspected at export by FGIS in the 1990/91 marketing year, just over 50 percent went out of ports in the Gulf of Mexico and nearly 40 percent was shipped out of ports in the Pacific Northwest. These wheat shipments went to more than 70 different foreign destinations.

The size and geographic dispersion of U.S. wheat production requires an immense system to move the grain to the various marketing outlets. The first step in the marketing channel is very often the local or country elevator, although some wheat is delivered initially to the subterminal elevator. These local elevators are owned either as single-site firms, part of a regional or multinational company, or as part of a farmer-owned cooperative. Most of the grain is moved from the farm to the elevator by truck. Wheat then moves through the system to subterminal elevators, export (or terminal) elevators, and/or domestic mills via train, trucks, and in the Midwest, via barge. Many loads of U.S. wheat are loaded and/or elevated 5 to 10 times before reaching end-users, increasing the odds of damage to the crop (U.S. Congress, 1989, p. 38). Grain handlers take care to keep the various classes of wheat separated because

[26]All production and consumption figures in this report will be provided on a metric basis, with bushel or pound equivalents provided only for the United States.

Appendix table 2--U.S. wheat exports as a share of production

Class	1987	1988[1]	1989	1990	1991
			Percentage share		
Hard red winter	89	72	51	31	59
Hard red spring	59	108	65	36	53
Soft red winter	46	67	63	42	31
White	97	108	77	69	87
Durum	67	44	60	43	43

[1]Drought required draw-down in stocks to meet domestic and export demands.

commingling classes reduces the value of the grain for any given end-use and reduces its grade.[27] Except when specified in export contracts, efforts are not generally made to segregate wheat lots by other characteristics, although occasional segregation of high-protein lots and lots with sprout damage is done.[28] In most instances it is physically possible to segregate wheat on the basis of several characteristics, but such activity is not deemed profitable by most elevator operators and traders.

Blending grain with different sets of factors to attain an intermediate-quality consignment is a common practice throughout the system. Because the official grading standards are set up with factor limits that vary considerably between grades, blending is usually a profitable activity for handlers who are faced with an asymmetric incentive structure in the rest of the system.

The domestic study found that discounts for high levels of dockage and foreign material are used considerably more frequently than premiums for low levels of these quality factors (Hyberg and others, 1993). This penalizes low-quality wheat more than it rewards high-quality wheat. Despite the resultant prevalence of mixing, cleaning is not a common activity at the country elevator level (except in the Northern Plains region, where spring wheat is produced with relatively high initial levels of dockage). The largest domestic buyers, such as millers, typically clean wheat in any case before milling it to meet their own particular milling specifications and are unwilling to pay significant cleaning premiums to intermediate handlers.

Variety control is not practiced by the U.S. Government; private firms and public research institutions control plant breeding, and the market governs variety release. Farmers generally are more interested in enhancing yield, since both the domestic marketing system and U.S. Government programs reward high yield better than quality factors (though the problem is less severe with the freezing of program yields since 1985), while processors are preoccupied with end-use performance. Since farmers are the direct clients of the plant breeder, their preferences generally prevail. Federal guidelines exist for the governance of variety release (within the state agricultural experiment station system), but there is no mechanism in place to enforce those guidelines for either public or private breeders. Breeders compare new varieties against old varieties in terms of quality and agronomic characteristics, but the main objectives are to increase yield, subject to climatic constraints on feasible wheat classes, and to meet certain end-use requirements.

The quality of U.S. wheat is tested at many points in the marketing channel, in nearly all cases starting at the country elevator. Because of the continuous intake of wheat at this first point of delivery, particularly at the peak of harvest, the tests performed are simple and focus on a few key factors, such as test weight, dockage, and sprout damage. These tests can be conducted rapidly and cheaply, so they do not interfere with the movement of grain. The results are used to determine what discounts or premiums that farmers might be assessed and whatever information for blending loads or selling wheat further downstream in the market that elevators might need.

[27]U.S. grain standards permit up to 5 percent contrasting classes for U.S. No. 2 wheat.

[28]Sprout damage to wheat kernels increases alpha-amylase activity in the flour, which retards the ability of the flour to thicken, which is important in most baked goods.

The quality of the wheat is monitored at nearly every succeeding level in the market channel, and loads or storage bins are often identified using a few key characteristics, particularly protein content for the hard wheat classes. Domestic millers typically collect samples of wheat from targeted production regions and country elevators during harvest and do extensive baking and flour-quality tests. On the basis of these results, domestic millers contract with country or subterminal elevators (occasionally contracting at the farm level), specifying tighter than No. 2 levels for many grade-determining factors, and then blend wheats to achieve the desired specifications (Harwood, Leath, and Heid, 1989). All of this quality testing is performed for private purposes only, and is not reported publicly.

Other U.S Government Programs and Regulations

Congress has mandated and USDA operates several different programs that have had a contradictory influence on U.S. wheat quality. On the one hand, the Government actively acquires and disseminates information about quality of the U.S. wheat crop. The USDA's Federal Grain Inspection Service is also charged with setting uniform standards for grain exported from the United States and inspecting that grain and certifying its characteristics. Other Departmental activities, however, have tended to encourage U.S. producers to emphasize yield over quality in their farming practices.

The U.S. Government supports the prices and/or income of its farmers through various domestic and trade policies. The price/income support program, the loan program, the export promotion programs, and the export credit program are the most important from a wheat quality perspective. On balance, they tend to reinforce volume rather than quality seekers. For the last several decades, U.S. producers of major field crops, including wheat, have been provided with per bushel payments. These payments have had the net effect of encouraging farmers to continue to boost their yields. Farmers were paid the difference between open market prices and a "target" price in the form of a deficiency payment. This payment was made on all eligible production--essentially all bushels harvested from eligible acreage. When deficiency payments were tied to fixed program yields under the 1985 Food Security Act, the incentive to enhance yield at the cost of other factors began to erode.

The nonrecourse loan program, designed to stabilize commodity prices by withdrawing grain from the system when supply is high and prices are low, also tends to promote yield over quality. During the 1980's, farmers were not penalized as heavily for entering low-quality (such as high dockage levels) grain into the program as they would if they sold it on the open market. Over the past few years, the Agricultural Stabilization and Conservation Service has made a concerted effort to match discounts on loan rates to market discount levels, although they are changed only once a year and tend to lag market movements. The effect of this shift is unknown, however, because the market price has been relatively high since 1987 and little grain has gone under loan and been forfeited (or rolled into the Farmer-Owned Reserve).[29]

The United States, as a major wheat exporter, also has several programs in place which affect the trading process on the world market. Because of the competitive nature of world wheat trade and domestic programs that have raised internal prices, particularly in the United States and the EC, many exporters have found it necessary to offer export subsidies and to expand the use of export credits to attract and hold import customers.[30] The United States introduced an export subsidy, the Export Enhancement Program, in late 1985 in order to counteract the effects of the restitutions (subsidies) used for wheat exports by the EC. The bonuses awarded under this program have sometimes permitted up to a 40-percent discount from world price levels for selected customers.

The United States also offers export credit guarantees (GSM-102, from 6 months to 3 years, and GSM-103, from 4 to 10 years) in order to assist importers who are

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[29]The Farmer-Owned Reserve (FOR) is a program designed to provide protection against wheat and feed grain production shortfalls and to provide a buffer against unusually sharp price movements. Farmers can place eligible grain in storage and receive extended loans for 27 months with extensions as warranted by market conditions. The loans are nonrecourse in that farmers can forfeit the commodity held as collateral to the government without penalty and without paying accumulated interest in full settlement of the loan. Grain is allowed entry into the FOR following the expiration of the 9-month loan if the following conditions exist: (1) if, for 90 days prior to December 15 of the wheat crop year the market price is 80 percent of the wheat loan rate, and (2) if the projected stocks-to-use ratio is more than 37.5 percent for wheat. If only one of these conditions exists, entry is at the discretion of the Secretary of Agriculture (Pollack and Lynch, 1991).

[30]The first GSM credit program was instituted in 1956 (GSM-5), but its use was intermittent (large sales under credit to the USSR in the mid-1970's). New programs were created in the 1970's and 1980's, but the use of these programs expanded both in terms of commodity and country coverage in the late 1980's (Ackerman and Smith, 1990).

experiencing difficulties acquiring hard currency to buy grain.[31] Finally, the United States also provides wheat and wheat flour to developing countries under the P.L.-480 food aid program, the terms of which vary according to the food needs and financial situation in each country.

The European Community (EC)

The EC has only recently become a major exporter of wheat, mainly as a side-effect of producer support offered by the Common Agricultural Policy (CAP) beginning in the 1970's. The EC first became a net wheat exporter in 1974, and now rivals Canada in some years as the second largest exporter. The EC plays a unique role as a major exporter and also as a fairly significant importer. The success of the CAP in promoting cereal production has led the EC to become exporters, but their system treats the surplus wheat generated by high CAP price supports as residual and its quality is not a high priority.

Among EC member states, the largest producers are France, Germany, the United Kingdom, and Italy; these countries are also the largest exporters (although Italy continues to be a net wheat importer (see app. table 3)). Most of the wheat produced in the EC is low- to medium-protein winter wheat, although 6-8 million tons of durum are also produced. Minor amounts of higher protein wheats are also produced in small regions of central Germany, southern France, and in Extremadura and New Castile in west-central Spain. Protein content has been increasing steadily for wheat grown in EC countries over the last decade. For example, the average protein content of common French wheat has gone from 10 percent to 12 percent in the last 30 years.

The EC Marketing System

The wheat marketing system in France is heavily focused on exports (60 percent of production is exported), but the wheat sectors of other EC members are less preoccupied with the world market situation. Overall EC exports outside the Community account for only about a quarter of total EC production. Wheat for export is drawn both from the open market and from grain bought at the support price by national stock-management agencies (called intervention stocks and intervention agencies). Traders who have negotiated export contracts submit bids to the EC Commission and are granted restitutions (effectively export subsidies) to underwrite the sale of surplus wheat abroad.

Per capita food consumption of wheat (flour equivalent) averaged 72 kg per person in the whole EC in 1989, slightly above levels in North America. But intake varied widely between EC members, from 44 kg in Denmark to 103 kg in Italy and Greece. Grain for domestic milling is generally purchased directly from producers or from local elevators. The widening use of wheat gluten in the EC (except in Italy) has reduced millers' need to import high-protein wheats for blending and has increased the share of low-protein wheats in the typical EC mill grist.

The EC's chief export markets are in the former USSR, the Middle East, and northern Africa. However, the EC also competes with the other major exporters in the Chinese, East European, and South Korean markets. The EC is also the largest exporter of wheat flour in the world. The largest French export facilities are in Rouen on the English Channel (about 50 percent of French wheat flour exports). Much of Italian wheat is exported through southern ports (such as Naples) to Northern Africa. Most British wheat moves out of southwestern U.K. ports. Wheat from the smaller EC exporters is also transshipped through Belgian and Dutch ports.

Wheat is delivered from farms to country elevators, which are licensed by the respective national intervention agencies (such as ONIC in France).[32] In France, 70 percent of local elevators are owned by farmer cooperatives, which market the wheat. The remainder are held by private and multinational traders. Grain for internal use is transported to mills by truck. Grain that is sold into intervention stocks is almost always exported. Grain moves to export facilities by truck and rail. Cleaning occurs at all points in the marketing chain. French cooperatives segregate wheat by variety and have begun to pay members extra for high protein wheat.

Regulations under which new wheat varieties are released to the public are promulgated at the national level, rather than EC-wide. As the EC seeks to create a single economic entity, it is likely that these national rules will have to be harmonized. In France, several different

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[31]The users of GSM-103 credit guarantees for the purchase of grain are generally granted 7-year loans.

[32]Office National Interprofessionel des Céréales (National Grain Intervention Agency).

Appendix table 3--Wheat production and net exports of EC members[1]

Country	1987	1988	1989	1990	1991
			Million tons		
Belgium-Luxembourg:					
Production	1.1	1.3	1.5	1.4	1.5
Net exports	-.9	-.5	-.3	-.6	-.6
Denmark:					
Production	2.3	2.1	3.2	4.0	3.7
Net exports	.5	.6	1.0	1.7	1.3
France:					
Production	27.2	29.5	32.1	33.6	34.6
Net exports	16.3	18.5	17.6	18.5	17.8
Greece:					
Production	2.1	2.3	2.0	1.7	3.0
Net exports	.5	.8	.7	.4	.6
Ireland:					
Production	.4	.4	.5	.6	.7
Net exports	-.3	-.3	-.2	-.2	-.1
Italy:					
Production	9.4	8.0	7.4	8.1	9.3
Net exports	-1.8	-1.7	-2.4	-2.8	-3.7
Netherlands:					
Production	.8	.8	1.0	1.1	.9
Net exports	-1.3	-1.3	-.6	-.4	-1.2
Portugal:					
Production	.5	.4	.6	.3	.3
Net exports	-.4	-.6	-.4	-.7	-.7
Spain:					
Production	5.8	6.2	5.2	4.7	4.8
Net exports	.1	.2	.4	-1.0	-1.1
United Kingdom:					
Production	11.9	11.8	14.0	14.1	14.5
Net exports	.3	1.0	2.9	3.3	3.8
Germany:[2]					
Production	9.9	11.9	11.0	11.1	16.6
Net exports	1.4	2.0	1.0	1.5	3.3

[1]A negative number in net exports represent net imports; figures include intra-EC trade. [2]Includes the landers of former East Germany in 1991. Total exports and production found in table 3. Source: USDA/ERS, Dec. 1992.

independent and governmental organizations are involved in variety release. New varieties are developed in both the public sector (universities and public research institutes) and in many private firms.[33] A committee appointed by plant breeders and overseen by the Ministry of Agriculture sets the criteria for approval, evaluates new varieties, and makes recommendations to the Ministry on the basis of their deliberations. The chief criterion is yield, but end-use tests such as the alveograph and the *zeleny test* also rank highly in determining release.

Similar systems of variety regulation are used in other EC countries. No national or EC-wide grain standards exist,

[33]The Groupement National Interprofessionel des Semences et Plants (National Seed and Plant Interprofessional Group, GNIS) and the Institut Technique des Céréales et des Fourrages (Technical Institute of Grains and Forage, ITCF) are organizations funded by the French cereal sector. GNIS is charged with regulating the dispersal of licensed seed varieties, and the ITCF is an applied research group for French crop agriculture.

although their introduction has been discussed by many EC member states. The only quality standards that do exist are those for entry into intervention. Certain results from end-use tests must be met in order to qualify for the breadmaking wheat premium. Intervention standards, which the EC Commission can change from year to year, include such physical factors as percentage of sound grain, test weight, and intrinsic factors measured by farinographs and falling number tests (Gilles and Sibbit, 1974; Sugden, 1992; Wilson and others, 1992). Testing of other wheat, if desired by buyers, must be done in the private sector. Many large millers test wheat samples from local elevators before buying. Private survey companies, such as the Societé Generale de Surveillance, can be hired to test for export contracts; they perform such services throughout Europe.

Other Aspects of EC Institutions and Programs

The CAP is an integrated system of policies in the EC that offers grain producers support prices generally well above world prices, thus raising production levels, protects EC markets against lower priced imports with a variable import levy, and uses restitutions to sell surplus grain on the world market. The recent reform of the CAP approved in June 1992 lowers price supports and sets up a per-hectare payment to compensate producers for lost income. The reform is due to begin in the 1993/94 marketing year. The payments, based on regional average yields, should reduce the incentive for EC producers to both expand output and boost yields. The current system offers an 8-10 European Currency Units per ton ($0.30-$0.40/bu, or $11-$14/ton) premium over the feed wheat price for the sale of breadmaking wheat into intervention; this has provided some incentive to EC producers to emphasize quality over yield (Wilson, 1989 (a)). All the details have yet to be worked out in the new CAP, but it has been decided that wheat will have to meet milling standards to qualify for sale into intervention beginning in 1993/94. Export credit has been offered at the national level only (chiefly by France with COFACE and Italy with Hermes) in the past, but recent sales to the former USSR have involved credit granted at the EC-level.

Canada

Canada is a major producer and exporter of wheat. Canada competes with the United States for high-protein wheat markets, and pits its high-protein wheat against lower protein wheats in other markets as well. More than 95 percent of the wheat in Canada is grown in the Prairie provinces (Alberta, Manitoba, and Saskatchewan). The major Canadian classes, CWRS and CWAD (see table 4), are comparable with the HRS and durum wheat grown in the U.S. Northern Plains. A small amount of high-protein winter and low-protein white spring wheat is grown in the Eastern Provinces of Ontario and Quebec, nearly all used domestically. The Canadian wheat sector is heavily dependent on exports, and is extremely sensitive to differing quality demands among importers.

The Canadian Marketing System

Only about a fourth of Canada's annual wheat output is consumed internally. That use is split between food use and feed use (both 10 percent) and seed use (5 percent). The price of wheat sold for domestic food consumption used to be controlled within a two-price system (domestic price kept within a certain band, while export price was allowed to follow world prices). The domestic price was freed up to follow U.S. cash market prices for the appropriate classes (Minneapolis for CWRS, Chicago for winter wheat) in late 1990 in anticipation of the removal of wheat trade barriers under the U.S.-Canadian Free Trade Agreement. Wheat is now sold domestically at the daily prices quoted for the U.S. commodity markets. Per capita wheat flour consumption for food use was about 66 kg in 1991, just above U.S. levels, but it has been declining gradually in recent years.

Canada exports wheat to about 50 countries in a normal marketing year, focusing its sales in China, the former USSR (together accounting for half of sales), Latin America, northern Africa, the Middle East, and other Asian countries (especially Japan and South Korea). Canada is also a major supplier to the EC, focusing on the United Kingdom and Italy. The largest export facilities for wheat are found at Thunder Bay, Port Cartier, and Baie Comeau (Great Lakes and the St. Lawrence Seaway), Vancouver and Prince Rupert (Pacific Coast), and Churchill (Hudson Bay) (Normile, 1983).

All of the wheat grown on the Western prairies and sold for export is delivered to elevators owned primarily by the provincial Wheat Pools (producer cooperatives in the Prairie Provinces) and the United Grain Growers (McCalla and Schmitz, 1979). These cooperatives together accounted for 75 percent of all local elevators in the late 1980's. Wheat for export is marketed by the Canadian Wheat Board (CWB), a Crown Corporation chartered by, but not part of, the Canadian Government. Wheat is moved through Canada almost exclusively by rail, which is subsidized by the Federal Government

through the Canadian Western Grain Transportation Act (WGTA). Terminal elevators are also owned by private companies and cooperatives; the CWB does not actually own any marketing or storage facilities but coordinates transportation and marketing.

Wheat destined for overseas is moved by rail to the terminal elevators, and cleaned at that point to meet tight export standards, including a requirement of no more than 0.3 percent for broken grain. This cleaning is financed by fees collected from wheat producers. Because the CWB has made its reputation as an exporter of consistent quality wheat, it tends to restrict blending at the terminal elevator. Blending at country elevators is not restricted, and profits from this operation accrue to the companies owning the elevators. Little grain moves through interior elevators, due to the added costs, which reduces the handling of each load.

The Canadian official standards differ somewhat from those in the United States. Dockage is defined as that material which can and must be removed in cleaning prior to grading of the wheat. Foreign material limits are divided into several separate categories, but the total foreign material component is somewhat tighter than U.S. standards (0.4 percent limit for No. 1 CWRS, as opposed to 0.5 percent for U.S. No. 1). Test weight standards for No. 1 and No. 2 differ between wheat classes in Canada, with durum standards the highest. The other important difference is the tolerance for wheat of other classes; U.S. No. 1 permits up to 3 percent of wheat of other classes, while No. 1 CWRS permits only 1.5 percent, including hard spring varieties that are not licensed.

The CWB is the sole marketing agent for Canadian wheat (and barley) exports, and contracts with cooperatives, private elevators, multinational grain traders, and importers to move wheat from country elevators to import destinations to attain the greatest profit for Canadian wheat producers. The Board also endeavors to provide price stability to producers through the "pooling" procedure. The Board pays producers at delivery an initial payment (minus freight costs and primary elevator costs) set at the beginning of a marketing year, and pools the returns from export sales, by class, for the year. Other marketing costs and Board operating costs are deducted from the pool, and the remainder is paid to producers as a final payment when all sales are settled (Harwood and Bailey, 1990). In years when the initial payments made exceed sales revenue, funds to cover the shortfall are allocated to the Board by the Canadian Government. Ensuring equitable access to the grain market is also a function of the Board, with its use of delivery quotas for producers. The quotas are defined on the basis of the farmer's assigned "base acreage," with national fixed yields per acre (U.S. Congress, 1989). Only that amount can be delivered to the Board. Separate prices are paid for each grade of wheat within classes, and the differentials have been substantial in the past.

Identity preservation in Canadian wheat marketing is basically redundant because of the strict variety control exercised by the Federal Government. Control is maintained by three separate 'Expert Committees,' which compare every proposed variety with the legally established standard varieties, Neepawa for high-protein spring wheat and Hercules for durum wheat (McDonald, 1991). A variety must meet certain criteria before release is approved: it must be at least equal in all quality aspects to Neepawa, or be visually distinguishable from the standard variety. This requirement excludes the semi-dwarf high-protein spring varieties developed in the Northern United States, which are higher yielding but inferior to Neepawa with respect to at least one quality standard. The stringency of these standards has kept the number of new varieties down to only 34 in a 60-year period, while more than 100 new varieties are introduced every decade or so in the United States (National Research Council, 1972). Because of the low probability of formal approval for new varieties and thus potential to earn a return, most plant breeders work for public sector agencies like the Canadian Grain Commission.

Grain is graded in Canada according to standards established by the Canadian Grain Commission. The standards are divided into two categories, primary and export, and are related to the classification system used for variety licensing. Export grade determinants include limits on several categories of foreign material, wheat of other classes, minimum vitreous kernels sprouted kernels, heat-damaged kernels, and shrunken and broken kernels. Other tests are conducted for statistical reporting, such as test weight, protein, falling number, flour yield, and *ash content*. Canadian standards stem from physical factors, but they maintain more complete information on intrinsic characteristics of their wheat than does the U.S. Government. Grain grown with unlicensed seed varieties must be segregated and sold for feed. Wheat not meeting requirements for No. 3 wheat (no more than 1.25 percent foreign material) must also be sold as feed wheat.

Other Canadian Government Programs

In 1991, the Canadian Government established the Gross Revenue Insurance Plan (GRIP) and the Net Income Stabilization Account (NISA) to supplant earlier income support programs. The GRIP program provides revenue protection rather than the yield protection of traditional crop insurance, and is funded by the Federal Government, provincial governments, and producer payments. The target revenue for each eligible crop is defined based on the farmer's historical yields, which cuts the incentive to boost yields at the expense of other factors (Simone and Harwood, 1991). NISA permits farmers to set up trust accounts (with similar government contributions), which can be drawn on at the farmer's discretion.

The Canadian Government makes less use of direct trade policies than most other major wheat exporters. The government grants short-term (3-year) export credit guarantees to certain import customers, and also provides food aid to countries under international criteria. The subsidizing of rail transportation through the Western Grain Transportation Act also helps make Canadian wheat exports competitive on the world market. The activity of the Board has in the past permitted Canada to act in some ways as a price leader, since the exclusive arrangements and bilateral agreements that the CWB sometimes engages in allow it to capture some market control. CWB's refusal to publish actual export prices makes it difficult to judge the extent to which they sell wheat abroad at prices lower than domestic levels (General Accounting Office, 1992), but with the advent of EC export restitutions and the EEP, the ability of the CWB to influence the market through bilateral agreements has been reduced. Their whole system is geared toward providing uniformity of product, but it may inhibit their competitiveness in those markets with less stringent quality requirements.

Australia

Australia is the fourth largest exporter in the world wheat market, and its marketing system is geared almost entirely to servicing the export market with high-quality products. At least 75-80 percent of Australian wheat produced is exported. Australia produces mostly white wheat, primarily of low to medium protein content, with small amounts of high-protein and durum wheat. The production regions are concentrated on the south and east coasts and in Western Australia. As with Canada, the Australian system is heavily focused on exports and pays very careful attention to maintaining wheat quality.

The Australian Marketing System

Domestic wheat consumption in Australia accounts for only about 15 percent of total disappearance. Per capita consumption of wheat flour products appears to be just below levels seen in the United States and Canada, between 55-60 kg per year. More than 20 percent of wheat utilized domestically goes into the manufacture of starch or wheat gluten, much of which is exported (Australian Bureau of Agricultural and Resource Economics, (ABARE) 1991). Wheat marketing for export is controlled by the Australian Wheat Board (AWB), which is a public but nongovernmental organization with monopoly authority to export wheat. Wheat marketing for domestic food use, previously handled by the AWB, was freed in 1989, which is expected to lead to an increase in onfarm and private storage capacity because of new marketing opportunities (Hunter and Hooper, 1992).

Over the last several years, nearly three-fourths of Australia's wheat exports have gone to seven major destinations: Iran, Iraq, Japan, Indonesia, Egypt, China, and a shrinking market share in the former USSR. Because the Australians traditionally store only a small portion of their wheat crop, and wheat production is integrated with wool-sheep production, their exports are quite subject to weather and world price variability. Australia exports its low- or medium-protein white wheats to markets in the Middle-East, China, and Indonesia; much of its high-protein white wheat goes to Japan. All wheat is exported through 20 seaboard terminals owned by the Bulk Handling Authorities (BHA), the State agencies, or farmer cooperatives that are the sole licensed receivers of grain for the AWB. Much of the wheat trade moves through Kwinana in Western Australia, Ports Lincoln and Adelaide in Southern Australia, Geelong in Victoria, and Sydney in New South Wales (ABARE, 1988).

Most wheat is either used within or exported from the State in which it is produced. Wheat, unless used onfarm for seed or feed or sold for stock-feed, is delivered to the State BHA's, which own and operate all off-farm facilities for storage and marketing within each State. The grain moves first to the local elevator or subterminal facility by truck, and then moves from first delivery to the export facilities by rail. Wheat is graded at the first delivery point, and must be segregated by class and grade when moving through the system. Necessary cleaning must occur before delivery to the BHA's; wheat for export

must be cleaned to very low levels of dockage. Farmers either install second screens on their combines to meet export standards or clean their wheat commercially.

Australia, like Canada, has fairly rigorous variety control procedures. Plant breeding is primarily funded publicly (the Commonwealth Scientific and Industrial Research Organization, or CSIRO), and scientists must derive all new varieties from other approved varieties. No red wheat varieties are licensed. A quality evaluation committee oversees release in each State, and new varieties must meet a broad set of guidelines, including milling characteristics. Even after a variety is released, the AWB can still assess discounts on varieties that do not meet market expectations. Variety must be declared upon initial delivery, and these declarations are subject to random checks by the Board.

Quality testing is handled by the AWB. The standards for accepting wheat (called receival standards) which are the basis for payments, are set by AWB. The net pool return paid to producers by AWB is driven off the price for ASW (see table 4). ASW, a low- to medium-protein (9.5-11 percent) wheat, accounts for about 70 percent of all wheat produced. The two classes ranked above ASW in terms of protein content, APH and Australian hard (AH), receive premiums, while general purpose and feed wheats receive discounts from the base price. These differentials vary annually, but in the late 1980's they amounted to 13 and 3 percent premiums for APH and AH, and discounts for the other wheat classes (U.S. Congress, 1989). Grades are also assigned within classes on the basis of limits for protein content or falling number measures. Dockage is not a measure used in the Australian standards; the standards refer to unmillable material, and the limits are the same for all grades. Weekly composite wheat samples are submitted by BHA's for testing from every location and silo so AWB knows the quality of wheat it has in its system. AWB also monitors the quality of wheat as it moves from the first elevator to export facilities.

Other Aspects of Australian Government Programs

The Australian Government intervenes little in the wheat export sector. The government does utilize export credit and food aid, though not in the scope employed by the United States, the EC, and Canada. As in Canada, the Board has a tendency to negotiate long-term bilateral agreements with major customers (usually state traders), which gives it a minor degree of market power.

Argentina

Argentina is the fifth largest exporter of wheat in the world, holding a 5-percent market share over much of the last decade, although their production and export share have often swung widely. The Argentine system is geared to move wheat to market and export it rapidly because of low storage capacity, and maintaining quality appears to not be a high priority. Usually about half of Argentine wheat production goes for exports. The major Argentine wheat classes are a medium-protein (about 12 percent) red spring (called Trigo Pan) wheat and durum wheat. The main production region is located in the provinces of Buenos Aires and Santa Fe, northwest of the city of Buenos Aires.

The Marketing System

Most of the rest of the Argentine wheat crop goes into human or industrial consumption, since little is stored and even less is fed to livestock. Total food use has been just under 4 million tons a year recently, or about 90 kg of wheat flour food products per person. Grain for domestic milling had been acquired through a government allocation program until 1990. Exports were also restricted through use of quotas (Hazera, 1986). Since that time, domestic millers have had to compete with traders for wheat on the open market.

Argentina's export sales are focused in Latin America and the Middle East, although it is also a major player at times in the Chinese and former Soviet markets. Lack of storage capacity gives Argentine exports a large seasonal component and also causes a drop in exports when bad weather cuts Argentine production. Over the last few decades, exports have fluctuated from 1.6 million tons in 1971 to nearly 10 million tons in 1984. In the past, many exports occurred under the auspices of long-term agreements negotiated between marketing agencies in importing countries and the Argentine National Grain Board (Junta Nacional de Granos, or JNG), such an agreement is currently in place with Brazil. With the phasing out of the Grain Board in 1992, such arrangements are potentially subject to change. Grain for export is shipped from Rosario, the largest port in terms of wheat export volume, Bahia Blanca, and Buenos Aires.

Argentine grain is delivered to the country elevator by truck immediately after harvest; very little onfarm storage exists. Grain moves to port by truck and to a lesser extent by the rail system, the latter being badly in need of

modernization and expansion. The handling facilities within elevators and port facilities are for the most part up to modern standards, but government regulations and union work rules made smooth operation sometimes difficult (Chiang and Blaich, 1983). These government regulations were repealed in 1991. Elevators at both the local and export levels are owned by large multinationals, farmer cooperatives, and until just recently, the JNG. The Argentine Government is divesting itself of marketing facilities and the rail system. All JNG country elevators were disposed of immediately after its dissolution; the river and port elevators are still in the divestment process, as the Argentine Government wishes to avoid handing over monopoly power to a single company. Both the deficiency of storage capacity and the fact that so much of the storage space is flat and thus the grain is not elevated inhibit their ability to blend grain.

The Argentine Government licenses new wheat varieties for release. A committee of industry representatives, producers, plant breeders, and government officials review agronomic and baking characteristics of new varieties, but their selection criteria appears to be somewhat biased toward higher yield in evaluating new varieties. Most scientists rigorously test their new variety in-house to ensure that it meets the minimum established criteria before they submit it for approval. Grain inspection became optional at the buyer's discretion with the dissolution of the JNG; such services can now be obtained privately or provided by the importer. Little cleaning has been necessary to meet the JNG's standards, which now will be maintained by the Ministry of Agriculture. Separate standards exist for the spring and durum classes of wheat; the grade-determining factors are similar to those in the U.S. standards, including foreign material, but not dockage.

Other Roles of the Argentine Government

In the past, Argentine government policy has been to seek to extract rent from the relatively efficient agricultural sector for the benefit of other sectors. This included use of export taxes, differential exchange rates, and export quotas. Beginning in 1989, the new civilian government began to phase out these policies to encourage agricultural production. The latest move, discussed above, was the reduction of the role of the JNG. The JNG withdrew from domestic acquisition in 1990, and was dissolved by Argentine President Menem in late 1991. Argentina's use of export credit and food aid has always been extremely limited, mostly due to its own economic constraints.

Appendix table 4--Variation between quality factors for U.S. export wheat

Class/factor	1986	1987	1988	1989	1990	1991
			Standard deviation			
Hard red winter:						
Shipment numbers	349	517	936	374	285	226
Foreign material	0.11	0.11	0.09	0.12	0.13	0.09
Dockage average	.13	.11	.12	.15	.14	.11
Shrunken and brokens	.54	.44	.48	.52	.30	.38
Hard red spring:						
Shipment numbers	316	334	548	316	306	207
Foreign material	.17	.12	.12	.14	.10	.09
Dockage average	.20	.28	.21	.23	.15	.21
Shrunken and brokens	.43	.34	.33	.44	.35	.39
Soft red winter:						
Shipment numbers	143	135	223	209	123	92
Foreign material	.10	.09	.11	.07	.07	.07
Dockage average	.21	.21	.16	.23	.16	.15
Shrunken and brokens	.33	.32	.29	.40	.37	.31
White:						
Shipment numbers	200	233	421	175	175	152
Foreign material	.11	.13	.09	.09	.10	.07
Dockage average	.15	.15	.15	.14	.16	.13
Shrunken and brokens	.37	.28	.18	.24	.23	.25
Durum:						
Shipment numbers	120	128	114	68	104	49
Foreign material	.49	.30	.22	.30	.20	.17
Dockage average	.24	.30	.38	.47	.30	.33
Shrunken and brokens	.45	.41	.44	.85	.64	.90

Source: USDA/FGIS, 1986-91.

Appendix table 5--Macroeconomic indicators of study countries, average 1986-91

Country	Wheat self-sufficiency	Population	GNP per capita	Interest/ total exports	Wheat/ total farm imports
	Percent	*Millions*	*Thousand dollars*	*Percent*	
Brazil	0.63	141	2,090	25.9	24.0
China	.88	1,091	336	4.1	39.0
Egypt	.27	50	654	11.2	25.0
Chana	0	14	386	7.9	15.0
Indonesia	0	172	523	14.6	23.0
Italy	.79	57	11,330	0	6.0
Japan	.15	122	17,311	0	5.0
Morocco	.63	23	753	15.1	28.0
Pakistan	.91	102	347	7.6	17.0
Philippines	0	57	634	18.5	20.0
South Korea	0	42	3,360	7.1	10.0
Sri Lanka	0	16	406	6.8	23.0
Taiwan	0	20	5,361	4.9	4.0
Tunisia	.49	8	1,221	8.7	25.0
USSR	.82	283	4,586	0	14.0
Venezuela	0	18	3,261	20.8	16.0
Yemen	.08	9	630	5.3	16.0

Sources: United Nations, Food and Agriculture Organization, 1986-91; World Bank, 1992; USDA/ERS, Dec. 1992.

Appendix B: Market Segmentation

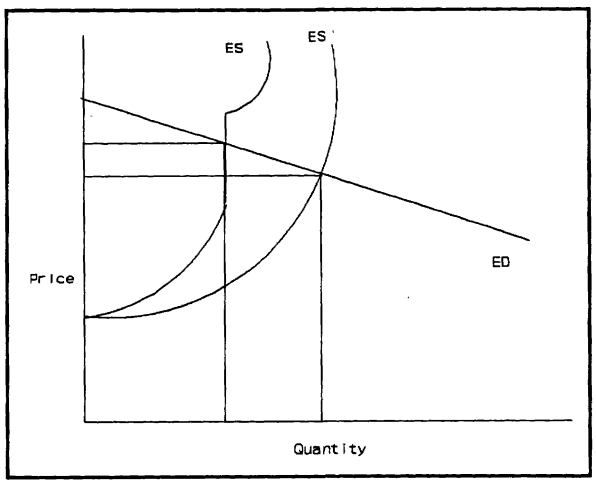
There appears to be a limited supply of low-dockage, high-protein wheat (provided primarily by Canada and Australia) available for import at modest premiums over standard wheat. Observation of the world market suggests the existence of a kinked supply curve that becomes almost totally inelastic when the quantity reaches about 15 million tons (the supply of high-protein wheat in Canada and Australia), and does not become elastic again until the premium becomes very large (app. fig. 1) (*Feedstuffs*, 1990; U.S. Congress, 1989). The demand for such wheat is hypothesized to intersect the supply curve in the region of the kink, but the demand function is also inelastic in that region. This curve lacks responsiveness because the structure of the world wheat market, especially the U.S. wheat sector, is not sensitive to a slight additional willingness-to-pay in a relatively small portion of the world wheat market.

The size of the U.S. marketing system and the way that the U.S. Government supports the grain industry (with income supports at the farm level and export subsidies at the export level) mean that it is generally sluggish in responding to such incentives. U.S. grain trading firms appear to be concerned more with maximizing profit through volume business rather than tailoring individual sales to quality-conscious buyers.

A country might consider demanding more low-dockage, high-protein wheat, but if the supply of such grain is known to be extremely inelastic, that importer knows that it could get into a bidding war with other such demanders and bid up the price considerably without actually receiving much more of such grain. So, it chooses to operate on the lower edge of this demand envelope. Few countries that import wheat seek only high-protein, low-dockage wheat in the relevant price range. Most buy a combination of low-dockage, high-protein wheat and either low-protein wheat or high-dockage, high-protein

Appendix figure 1

The world market for low-dockage, high-protein wheat



wheat. For example, while EC countries buy only high-protein wheat from countries outside the EC, they do buy low- and medium-protein wheat from other EC countries.

If the United States makes a concerted effort to make a low-dockage, high-protein wheat available on the world market, this would rotate the excess supply curve for such wheat rightward. The supply curve would also become more elastic, since if the U.S. marketing system were so inclined, it is more capable of producing large amounts of high-protein wheat (and potentially low-dockage) for the export market than are other major exporters.

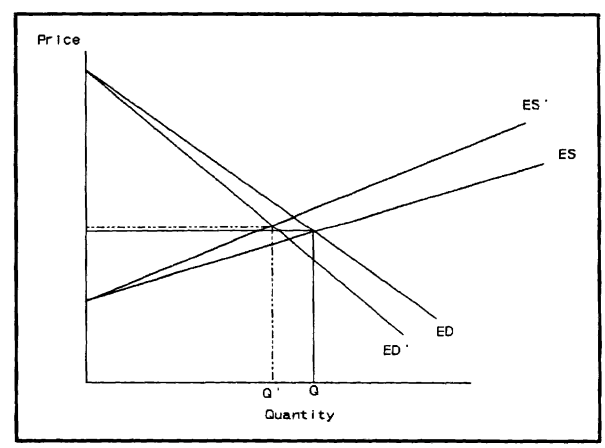
If wheat importers who have a preference for high-protein, low-dockage wheat at current prices recognize that the supply environment is altered by the new U.S. sensitivity, then they may be willing to shift to the higher portion of their demand function. This would lead to an increase in their purchases of high-protein, low-dockage wheat, and perhaps a slight price increase, depending on the supply elasticity in that price range.

Because no importer interviewed seemed to express a willingness to increase its wheat imports overall, the increase in purchases of high-protein, low-dockage wheat (segment A) implies a more-or-less matching decline in imports in some other wheat market segments. The other segments of the world wheat market can be described as follows (omitting durum wheat markets): (1) high-protein, high-dockage wheat (segment B) (2) low- to medium-protein, high-dockage wheat (segment C), and (3) low- to medium-protein, low-dockage wheat (segment D). The decline in purchases in the first market segment would primarily be U.S. HRW or HRS that has been cleaned and is now sold as low-dockage, high-protein wheat, but some would also be Argentine Trigo Pan wheat that has been forced off the export market. Some of the decline would also come in the other two categories, mostly at the expense of the EC. As the supply of high-dockage, high-protein wheat is clearly declining (as HRW and HRS are increasingly cleaned), the excess supply curve for this market segment rotates leftward, so in this market quantity exported would decline and the price change would be unclear (app. fig. 2).

Overall, the composition of U.S. exports would likely shift between these market segments and may only increase modestly, if at all, in aggregate. However, such a strategy would enable U.S. exporters to target quality-conscious markets with clean wheat and enhance the U.S. market share.

Appendix figure 2

The world market for high-dockage, high-protein wheat



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