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GRADING AND PRICING PRACTICES OF NORTH DAKOTA COUNTRY ELEVATORS

For Durum and Hard Red Spring Wheat

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Highlights

Country elevators have an important role in the marketing of wheat. Included in that role is the communication of the value of wheat quality between destination markets and producers. In this study the grading and pricing practices of North Dakota country elevators for durum and HRS wheat were examined. This study was the first of a planned series of annual studies of grading and pricing practices. Primary data for the study was collected by conducting personal interviews with 77 country elevator managers.

Grading practices of country elevators were compared to the methods used for federal grain inspection standards. Short cuts were sometimes used to save time and money. Price adjustments for the various grade and nongrade factors were examined for significant differences by location in the state, storage capacity, distance to competition, and the board price for durum and HRS wheat. Significant differences in price adjustments were found only for HRS wheat protein by location in the state. Conditioning cost data were also collected, such as the cost of cleaning and drying, and wheat screenings prices. The data for cleaning costs and the price of wheat screenings were used to examine the economics of cleaning wheat.

The authors wish to express their appreciation for the support of the North Dakota State Wheat Commission. We would also like to thank the country elevators participating in this survey. Without their assistance, a study of this type could not have been undertaken.

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Steven Gunn & William Wilson*

Introduction

To wheat producers, grain elevator managers, millers, bakers, and the many others who transform wheat in the field to food on the table, wheat has many different desired characteristics. The quality of wheat desired by millers and importers is not the same as field run wheat, straight from the combine. Wheat markets, therefore, have a considerable task of communication and physical sorting to bring the desired type and quality of wheat from the field to the processor and importer.

Grain grades were established to facilitate the trading of wheat and other grains (Cramer and Heid 1983). Grain grades theoretically serve to standardize the product according to its quality. Standardization of wheat enables traders to buy and sell wheat on description rather than inspection of each lot. This standardization enables grain handlers to commingle grain from many sources into a few categories and thereby reduces the need for segregated storage. Standardization of wheat also provides a method for buyers to estimate the value of a specific lot of wheat and to communicate this value back to the producer.

Country elevators perform four important tasks in the wheat marketing channel (Russell 1978). First, country elevators assemble wheat from producers. Second, after the wheat is assembled, it is conditioned (dried, cleaned, binned, and blended) by the elevator for storage and/or shipment. Third, the country elevator loads railcars and trucks with wheat for shipment to destination markets. Fourth, country elevators act as market communication links between the destination markets and producers.

In this study the trading practices of North Dakota country elevators, with respect to pricing of quality, were examined for two important classes of wheat produced in the state, durum and hard red spring (HRS) wheat. North Dakota is an important producer of both classes of wheat; the state grew 76 percent of the total U.S. production of durum and 43 percent of the total U.S. production of HRS wheat in 1984. Durum, an amber-colored spring wheat with very hard vitreous kernels, is usually milled into a coarse flour called semolina. Semolina is used to make pasta products such as spaghetti, noodles, and macaroni. Durum wheat is also used to make puffed wheat. Hard Red Spring wheat, a high protein red spring wheat with very hard vitreous kernels, is milled into flour and used for bakery products such as bread and rolls. Often HRS wheat will be blended with lower protein winter wheats to upgrade their milling and baking qualities.

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Objectives of Study

The objective of this study is to document the trading practices among North Dakota country elevator managers regarding their pricing of grade and nongrade quality factors in durum and HRS wheat. A survey was administered in the form of a personal interview to country elevator managers across North Dakota in December 1984. The questionnaire used in the survey is included in Appendix A. The results of the analysis of the survey are presented in this paper.

Description of Elevators Visited

Eighty North Dakota elevator managers were interviewed to get an indication of the trading practices among country elevators with regard to pricing wheat. Seventy-seven of the 80 elevator managers responded to the survey. Elevators in every section of the state were visited to get an indication of statewide elevator pricing practices. The elevators represented a wide range of organizational structures, total shipments, loadout capacity, storage capacity, and distance to nearest competition.

The type of organization varied among the elevators. Fifty of the elevators responding were locally owned cooperatives, 6 were line elevators for Harvest States, 8 were locally owned private elevators, and 13 were line elevators for large private grain companies.

The elevators also had a wide range in total shipments of commodities (Table 1). For example, annual shipment of durum averaged 387,246 bushels

TABLE 1. AVERAGE, HIGH, AND LOW ANNUAL SHIPMENTS OF SPECIFIED COMMODITIES AMONG SELECTED COUNTRY ELEVATORS IN NORTH DAKOTA, (DECEMBER 1984)

Commodity	Number of Responses	Average of Total Shipment	High	Low	Combined Total Shipment by Elevators
		bushels			
Durum	69	38,246	4,400,000	0	26,719,974
HRS wheat	69	911,946	11,000,000	25,000	62,924,000
Corn	69	84,521	1,600,000	0	5,831,949
Soybeans	69	39,348	380,000	0	2,715,012
Flax	69	19,928	200,000	0	1,375,032
Barley	69	344,957	2,910,000	0	23,802,033
Sunflowers	69	900,000	900,000	0	6,513,945

SOURCE: Question I.6.

among the 69 elevators responding, with a high of 4,400,000 bushels and a low of 0 bushels. Annual shipments for HRS wheat averaged 911,942 bushels among the 69 responding elevators with a high of 11,000,000 bushels and a low of 25,000 bushels. The elevators also varied considerably in their total shipments of corn, soybeans, flax, barley, and sunflower.

The elevators varied considerably in their loadout capacity, which is the maximum number of railcars that could be loaded by each elevator in one day. Three elevators had a maximum loadout capacity of less than 3 cars per day, while another three elevators had a maximum loadout capacity of more than 54 cars per day (Table 2).

The storage capacities of the elevators also varied. Each elevator manager was asked to give the storage capacities of the mainhouse, plus additional flat and upright storage in annexes. Storage capacities in the mainhouse varied from 26,000 bushels to 2,100,000 bushels (Table 3). Flat storage capacities in annexes varied from 0 to 1,000,000 bushels, and upright storage in annexes varied from 0 to 1,650,000 bushels.

The elevators varied in the distance to their nearest competition. Twenty-three elevators were within one mile of their closest competitor while fourteen were more than ten miles from their nearest competitor (Table 4).

Use of commission companies and track buyers varied among the elevators surveyed. Harvest States purchased an average of 41.8 percent of the durum wheat and 38.7 percent of the HRS wheat from the elevators responding

TABLE 2. FREQUENCY OF LOADOUT CAPACITIES WITHIN SPECIFIED RANGES AMONG SELECTED COUNTRY ELEVATORS IN NORTH DAKOTA, (DECEMBER 1984)

Range of Loadout Capacity	Frequency	Percentage of Total
Less than 3 rail cars per day	3	4
Between 3 and 6 cars per day	12	16
Between 7 and 12 cars per day	26	34
Between 13 and 26 cars per day	25	32
Between 27 and 54 cars per day	8	10
More than 54 cars per day	3	4

SOURCE: Question I.7.

TABLE 3. AVERAGE, HIGH, AND LOW STORAGE CAPACITY OF SPECIFIED TYPES OF STORAGE FACILITIES AMONG SELECTED COUNTRY ELEVATORS IN NORTH DAKOTA, (DECEMBER 1984)

Type of Storage Facility	Number of Responses	Average Storage Capacity	High	Low
		bushels		
Main house	77	230,850	2,100,000	26,000
Flat storage (annex)	77	84,950	2,000,000	0
Upright storage (annex)	77	125,500	1,650,000	0
Total storage	77	440,800	-	-

SOURCE: Questions I.8, I.9, and I.10.

TABLE 4. FREQUENCY OF PROXIMITY TO COMPETITION WITHIN SPECIFIED RANGES AMONG SELECTED COUNTRY ELEVATORS TO NORTH DAKOTA, (DECEMBER 1984)

Range	Frequency	Percent of Total
Less than one mile	23	30
Between one and five miles	5	7
Between six and ten miles	35	45
More than ten miles	14	18

SOURCE: I.11.

Table 5). Other major buyers from the elevators were Atwood-Larson, Benson-Quinn, Cargill, Kellogg, Peavey, Continental, International Multifoods, and Pillsbury. Very few elevators sold to more than three different buyers. Use of commission companies and track buyers differed between eastern and western North Dakota. State Highway 3, between Dunsieth and Ashley, was used as the dividing line between east and west. Harvest States, Atwood-Larson, and Continental were used more in the west than in the east. Benson-Quinn, Cargill, Kellogg, Peavey, International Multifoods, and Pillsbury were used more in the east than in the west.

The preceding description of the country elevators responding to the survey indicates that the elevators varied considerably in organizational structure, annual shipments of various commodities, use of commission companies and track buyers, loadout capacity, storage capacity, and proximity to competition.

TABLE 5. AVERAGE PERCENT OF DURUM AND HRS WHEAT SOLD TO VARIOUS COMMISSION COMPANIES AND TRACK BUYERS AMONG SELECTED ELEVATORS IN NORTH DAKOTA, (DECEMBER 1984)

Commodity	Commission Company or Track Buyer	Average Percentage Sold to Each	Average Percentage Sold Among East ND Elevators	Average Percentage Sold Among West ND Elevators
Durum	Harvest States	41.8	40.7	44.5
	Atwood-Larson	13.9	9.1	25.9
	Benson-Quinn	12.1	13.4	9.0
	Cargill	8.8	10.1	5.8
	Kellogg	7.8	9.1	4.5
	Peavey	5.7	8.0	0.0
	Continental	2.7	1.4	6.1
	International Multifoods	2.3	2.7	1.1
	Pillsbury	1.4	1.9	0.1
	Others	3.5	3.6	3.0
HRS Wheat	Harvest States	38.7	37.8	42.0
	Atwood-Larson	13.4	8.4	25.9
	Benson-Quinn	11.0	12.4	7.4
	Cargill	10.0	11.5	6.5
	Kellogg	7.9	9.1	4.8
	Peavey	6.8	9.5	0.0
	Continental	2.6	1.2	6.1
	International Multifoods	2.7	3.4	0.9
	Pillsbury	1.3	1.8	0.1
	Others	5.6	4.9	6.3

SOURCE: Question I.12.

Grading Practices of Country Elevators

Sorting and pricing of desired types and quantities of wheat is facilitated by orderly grading of the grain as it enters the local elevator. In this section the grading practices of local elevators are examined and compared to the official grading methods.

Wheat entering country elevators is sampled and graded. Sampling of grain entering country elevators in North Dakota is usually done by an electronic probe or catching samples from the flow of grain as it is being dumped. The sample taken is treated as representive of the load. After the sample is taken, the wheat is graded by an elevator employee to determine its quality and conditioning needs.

The procedures used by the elevator employee to determine the quality of the wheat approximate, but are not exactly the same as, those used by federal grain inspectors. Some reasons why the elevator employee would not follow the exact procedures are that determinations of some quality factors either take too much time, require expensive equipment, or the wheat entering the elevator during certain years may be acceptable and sufficiently homogeneous for some quality factors without a quality determination.

Inspection services are private companies used by country elevators for grading grain. Because strict standards are required for federal licensing, not all inspection services have federal licenses. Seventy-seven of the elevators surveyed offered the producer the option of checking the grade determined at the elevator against a grade from a federally licensed inspection service. The managers commented on how often the elevator checked its grade by sending in a sample to an inspection service. An average of 21 percent of the durum grades and 20 percent of the HRS wheat grades were checked by an inspection service according to the responses. The range in usage was from 0 to 100 percent for both commodities.

Two types of quality factors exist for durum and HRS wheat in the United States. Throughout this report they will be referred to as grade and nongrade factors. Grade factors were standardized under the 1976 Grade Standards Act (U.S. Grading Standards 1984), and include test weight, total damaged kernels, heat damaged kernels, foreign material, shrunken and broken kernels, total defects, contrasting classes, and wheat of other classes. Grade factors are used to determine a numerical grade for the sample. Nongrade factors include color, dockage, moisture, protein, and variety. These factors help indicate quality of the sample but are not used in determining a numerical grade.

Evaluation of Grade Characteristics for Durum and HRS Wheat

Wheat is tested for each of the grade factors to determine overall grade. Results of the tests for each factor are compiled and compared to the acceptable limits prescribed by the 1976 Grain Standards Act and its applicable revisions (Table 6) (U.S. Grading Standards 1984). Grading, then, is ranking the quality of wheat according to its grade factors. In the United States grading system, wheat can only grade as high as the lowest grade obtained by any one grade factor. This method is called the least factor

TABLE 6. UNITED STATES GRADE STANDARDS FOR WHEAT

Grade	Minimum Test Weight, lb/bu		Maximum Limits (%)						
			Defects					Wheat of Other Classes	
	Hard Red Spring Wheat	All Other Classes	Heat Damaged Kernels	Total Damaged Kernels	Foreign Material	Shrunken & Broken Kernels	Total Defects	Contrasting Classes	Wheat of Other Classes
1	58.0	60.0	0.1	2.0	0.5	3.0	3.0	1.0	3.0
2	57.0	58.0	0.2	4.0	1.0	5.0	5.0	2.0	5.0
3	55.0	56.0	0.5	7.0	2.0	8.0	8.0	3.0	10.0
4	53.0	54.0	1.0	10.0	3.0	12.0	12.0	10.0	10.0
5	50.0	51.0	3.0	15.0	5.0	20.0	20.0	10.0	10.0

SOURCE: USDA 1984, p. 1.7.

approach. For example, if all the grade factors grade number one except one which falls into the number three grade, the wheat sample will grade number three.

Grading Slips

Grading slips are used to report important information about the grain. Figure 1 gives an example of a country elevator grading slip, and Figure 2 gives an example of a grading slip of a grain inspection service. Grading slips are intended to show the kind, class, grade, quality, condition, quantity, and any other facts relating to the grain determined to be important enough to be reported.

Customer's Name _____ Date _____

Address _____ Driver { ON / OFF } _____

GROSS _____ Gross Bu. _____

TARE _____ Dkge. Bu. _____

NET Net Bu. _____

Price $ _____ Amount $ _____

Kind of Grain _____ Grade _____ TEST Weight Per Bu. _____ Per Cent of Dockage _____

Moist _____ Check No. _____ Storage Tkt. No. _____ Assembly Sheet No. _____

Protein _____ Plump _____ Thin _____ % Foreign Mat. _____

This Certificate is not a storage ticket and is not negotiable. It should be presented on day of issue for a lawful storage ticket or cash check.

SCALE TICKET

Certificate of Grade, Weight and Dockage of Grain Weighed Over the Scales of

7522

10110 (VL)

210110 (VL) VICTOR Redi-Set FORM
VICTOR LUNDEEN CO., PRINTERS, FERGUS FALLS, MINN.

Figure 1. Example of Grading Slip from a Country Elevator

NORTH DAKOTA GRAIN INSPECTION SERVICE, INC.
OFFICIAL CERTIFICATE
SUBMITTED SAMPLE INSPECTION

ORIGINAL
NOT NEGOTIABLE

NRN°: 9335SF

Please refer to this certificate by its number, lettered prefix, number, and date.

FARGO, NORTH DAKOTA (ISSUED AT)

(DATE OF SERVICE)

I certify that I am licensed or authorized under the United States Grain Standards Act (7 U.S.C. 71 et seq.) to inspect the kind of grain covered by this certificate and that on the above date the following identified grain was inspected under the Act, with the following results:

☐ ORIGINAL INSPECTION ☑ REINSPECTION ☐ APPEAL INSPECTION ☐ BOARD APPEAL INSPECTION

QUANTITY OF GRAIN IN SAMPLES	IDENTIFICATION OF SAMPLE	SAMPLE SUBMITTED BY
GRAMS		

The sample identification and inspection results shown on this certificate are assigned only to the quantity of grain in the sample indicated and not to any identified carrier, container, or lot from which the sample of grain may have been taken. This certificate does not meet the inspection requirements of Section 5 of the Act.

GRADE AND KIND

U. S. NO.

TW %	M %	HT %	DKT %	SM %	SHBN %	DEF %	CCL %
WOCL %	BCFM %	SBLY %	BN %	THIN %	BB %	SKBN %	OG %
WO %	SO %	FMOW %	BNFM %	SPL %	BBB %	HVAC %	DST %

REMARKS:

OIL CONTENT _____%, 10 percent moisture basis.

(See reverse side for abbreviations)

NAME OR SIGNATURE

OFFICIAL TITLE
GRAIN INSPECTOR

BY

VOID OFFICIALLY SAMPLED

This certificate is issued under the authority of the United States Grain Standards Act, as amended (7 U.S.C. 71 et seq.), and the regulations thereunder (7 CFR 800.0 et seq.). It is issued to show the kind, class, grade, quality, condition, or quantity of grain, or the condition of a carrier or container for the storage or transportation of grain, or other facts relating to grain as determined by official personnel. The statements on the certificate are considered true at the time and place the inspection or the weighing service was performed. The certificate shall not be considered representative of the lot if the grain is transshipped or is otherwise transferred from the identified carrier or container or if grain or other material is added to or removed from the total lot. If this certificate is not canceled by a superseding certificate, it is receivable by all officers and all courts of the United States as prima facie evidence of the truth of the facts stated therein. This certificate does not excuse failure to comply with the provisions of the Federal Food, Drug, and Cosmetic Act, or other Federal law.

WARNING: *Any person who shall knowingly falsely make, issue, alter, forge, or counterfeit this certificate, or participate in any of such actions, or otherwise violate provisions in the U.S. Grain Standards Act, the U.S. Warehouse Act, or related Federal Laws, is subject to criminal, civil, and administrative penalties.*

NORTH DAKOTA GRAIN INSPECTION SERVICE, INC.
OFFICIAL CERTIFICATE
SUBMITTED SAMPLE INSPECTION

ORIGINAL
NOT NEGOTIABLE

NRN°: 9336SF

Figure 2. Example of Grading Slip from a Grain Inspection Service.

Test Weight

Test weight is a grade factor which is a measure of the wheat's density (pounds per bushel). Test weight generally gives an indication of the number of pounds of flour that may be milled from a bushel of wheat. Generally the higher the test weight the denser the grain and the higher the flour yields (Hyslop 1970).

North Dakota country elevators were very similar in their method of determining test weight for wheat. All managers used a machine to determine test weight for durum and HRS wheat (Table 7). The method used by the elevators for determining test weight is very close to that used by federal grade inspectors. The tools necessary to determine test weight are a Cox funnel, an approved dockage tester, a one-pint steel container, a straight-edged leveler, and a scale calibrated to convert test weight from pints to Winchester bushels. After a sample has been "cleaned" by a dockage tester, the sample is dumped into the Cox funnel. The funnel is then opened to fill the steel container to overflowing. The grain is then leveled with the straight-edged leveler with three equal zig-zag movements across the steel container. The contents of the container are then dumped onto the scale, and the test weight, in tenths of a pound per bushel, is recorded. Among the types of scales used by the responding elevators were Toledo (68), Pennsylvania (5), and Seedburo (4) (Table 8). Test weight is officially reported in tenths of a pound per bushel, but many country elevators may round to the nearest pound.

Total Damage

Total damage is used as a measure of the quality of wheat since damaged kernels of wheat affect the milling and baking quality of the wheat (Hyslop 1970). Damaged kernels are kernels, pieces of kernels, and other grains that are badly ground damaged, badly weather damaged, diseased, frost damaged, heat damaged, insect bored, mold damaged, sprout damaged, or otherwise materially damaged (U.S. Grading Standards 1984). Heat damage is a grade factor by itself and is included with total damage to restrict the amount of total damage in wheat.

The country elevators' managers used very similar methods of testing for damage. For durum, 68 managers responded that they use a visual inspection to determine the amount of total damage while 6 managers responded that they sent a sample to a licensed service inspection (Table 7). For HRS wheat, 73 managers responded that they used visual inspection to determine the amount of total damage, 3 managers sent samples to a federally licensed inspection service, and 1 manager did not determine a grade for total damage. Total damage is officially determined on a 50-gram sample of wheat free of dockage and shrunken and broken kernels (U.S. Grading Standards 1984). The damaged kernels are removed by visual inspection, then weighed. The percentage of the total damaged kernels is officially reported in tenths of a percent, but country elevator managers may round to the nearest whole percent.

In years of excellent durum and HRS wheat quality, such as 1984, elevator managers often will not test the wheat for damage. Wheat during these years is examined by a quick glance at handfuls of the wheat as the

TABLE 7. FREQUENCY OF USE OF SPECIFIED METHODS FOR DETERMING VALUE OF GRADE AND NONGRADE FACTORS FOR DURUM AND HRS WHEAT AMONG SELECTED ELEVATORS IN NORTH DAKOTA,(DECEMBER 1984)

Commodity	Grading Factor	Determine Factor by Visual Inspection		Determine Factor by Machine		Determine Factor by Sending Sample into a Federally Licensed Inspection Plant		Factor Determined	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Durum	Test weight	0	0	74	100	0	0	0	0
	Total damage	68	92	0	0	6	8	0	0
	Foreign material	51	70	15	20	4	5	4	5
	Shrunken & broken kernels	44	59	22	30	5	7	3	4
	Contrasting classes	68	92	0	0	6	8	0	0
	Dockage	0	0	74	100	0	0	0	0
	Moisture	0	0	74	100	0	0	0	0
	Protein	0	0	0	0	0	0	74	100
	Color	69	93	0	0	5	7	0	0
	Variety	13	17	0	0	16	22	45	61
HRS Wheat	Test weight	0	0	77	100	0	0	0	0
	Total damage	73	95	0	0	3	4	1	1
	Foreign material	55	72	17	22	4	5	1	1
	Shrunken & broken kernels	44	57	27	35	4	5	2	3
	Contrasting classes	71	92	0	0	5	7	1	1
	Dockage	0	0	77	100	0	0	0	0
	Moisture	0	0	77	100	0	0	0	0
	Protein	0	0	73	95	4	5	0	0
	Color	32	41	0	0	2	3	43	56
	Variety	6	8	0	0	1	1	70	91

SOURCE: Questions III. HRS wheat 1. and III. Durum. 1.

TABLE 8. TYPES OF GRADING EQUIPMENT USED TO TEST FOR TEST WEIGHT, DOCKAGE, MOISTURE, AND PROTEIN AMONG SELECTED ELEVATORS IN NORTH DAKOTA, (DECEMBER 1984)

Grading Factor	Type of Machine Used	Frequency	Percentage
Test weight	Toledo scale	68	88.3
	Pennsylvania scale	5	6.5
	Seedburo scale	4	5.2
Dockage	Carter dockage machine	72	93.5
	Emerson dockage machine	5	6.5
Moisture	Motomco	51	66.2
	Burrows	13	16.9
	Steinlite	12	15.6
	Neotec	1	1.3
Protein	Neotec	40	51.9
	Infralizer	13	16.9
	Dickey-John	13	16.9
	Trebor	5	6.5
	Udy	2	2.6
Send Sample to Federally Licensed Inspection		4	5.2

SOURCE: Question II. D. 1.

producer's truck is being dumped to determine if a grade check is necessary. The same is true for other grade factors such as heat damage, shrunken and broken kernels, foreign material, total defects, contrasting classes, wheat of other classes, and color.

Heat Damage

Heat damage is another measure of the quality of wheat. Heat-damaged wheat has been materially discolored and damaged by heat (U.S. Grading Standards 1984). This condition often occurs when tough (high moisture) wheat is stored and heated by fermentation. It also can occur during artificial drying if the kernel temperature becomes high enough to discolor the kernel.[1] Officially a 50-gram sample of wheat free of dockage and shrunken and broken kernels is used to determine the percentage of heat damage in the wheat (U.S.

[1]The managers were not asked their method of determining heat damage because it was believed to be the same as the method of determining total damage.

Grading Standards 1984). The kernels of wheat with heat damage are removed by visual inspection and weighed. Heat damage is officially reported as a percentage of total weight in tenths of a percent.

Foreign Material

Foreign material is all matter other than wheat that remains in the sample after the removal of dockage and shrunken and broken kernels (U.S. Grading Standards 1984). Foreign material is weighed and paid for as if it were wheat. Because the amount of foreign material affects the extraction rate and the baking quality of the flour, foreign material is undesirable.

Elevator managers used very similar methods of testing for foreign material. For durum, 66 managers used a visual inspection, 4 managers sent samples to federally licensed inspection service, and 4 managers did not determine a grade for foreign material (Table 7). For HRS wheat, 72 managers used visual inspection to determine the percentage of foreign material, 4 managers sent samples to a federally licensed inspection service, and 1 manager did not determine a grade.

Foreign material is officially determined on 50 grams of wheat free of dockage and shrunken and broken kernels (U.S. Grading Standards 1984). The foreign material is picked from the sample by visual inspection and weighed. Foreign material is officially reported as a percentage of total weight rounded off to the nearest tenth of a percent.

Shrunken and Broken Kernels

Shrunken and broken kernels are all matter which can be removed from a sample of dockage-free wheat by use of an approved screening device in accordance with federal grain inspection procedures (U.S. Grading Standards 1984). Millers often need whole mature wheat kernels to produce flour with desired quality. Large amounts of shrunken and broken kernels would thus damage the flour quality and reduce flour yields.

The methods of determining the percentage of shrunken and broken kernels varied among the elevators responding. For durum, 44 managers determined shrunken and broken kernels by visual inspection, 22 managers used a machine, 5 managers sent samples to a federally licensed inspection service, and 3 managers did not determine a grade (Table 7). For HRS wheat 44 managers determined shrunken and broken kernels by visual inspection, 27 managers used a machine, 4 managers sent samples to a federally licensed inspection service, and 2 managers did not determine a grade.

The percentage of shrunken and broken kernels is officially determined on a 250-gram sample of wheat free of dockage (U.S. Grading Standards 1984). The wheat is placed on a sieve with .064"x.375" oblong holes. The sieve is shaken sideways till particles stop falling through the holes. Grain remaining in and on the sieve is weighed back. The percentage missing on the weighback is the percentage of shrunken and broken kernels. The amount of shrunken and broken kernels is officially reported to the nearest tenth of a percent. Country elevator managers often will round to the nearest whole percent.

Total Defects

Total defects are damaged kernels, foreign material, and shrunken and broken kernels (U.S. Grading Standards 1984). The more total defects in the wheat, the lower the milling and baking quality of the wheat. The sum of total damage, foreign material, and shrunken and broken may not exceed the limits set for total defects for each numerical grade.[2] Total defects is officially reported to the nearest tenth of a percent (U.S. Grading Standards 1984).

Contrasting Classes

Contrasting classes occurs whenever two or more kinds of wheat for which the end uses differ are mixed. Contrasting classes for durum are HRS wheat, hard red winter (HRW) wheat, soft red winter (SRW) wheat, unclassed wheat, and white wheat. Contrasting classes for HRS wheat are durum, unclassed wheat, and white wheat.

The elevator managers used very similar methods for testing for contrasting classes. For durum, 68 managers used visual inspection to determine grade while 6 managers sent samples to a federally licensed inspection service (Table 7). For HRS wheat, 71 managers used visual inspection to determine grade, 5 managers sent a sample into an inspection service, and 1 manager did not determine a grade.

Officially a 25-gram sample of wheat free of dockage, shrunken and broken kernels, and foreign material is used to determine contrasting classes (U.S. Grading Standards 1984). Kernels from contrasting classes are picked out by visual inspection. These kernels are then weighed back. Contrasting classes is officially reported as a percentage of total weight and is rounded to the nearest tenth of a percent. Country elevator managers often round contrasting classes to the nearest whole percent.

Wheat of Other Classes

There are seven classes of wheat according to the Federal Grain Inspection Service: hard red spring, hard red winter, soft red winter, durum, white, unclassed, and mixed (U.S. Grading Standards 1984). An example of wheat of other classes would be any admixture of different classes of wheat.[3] Officially wheat kernels of other classes are removed by visual inspection (U.S. Grading Standards 1984). These kernels are weighed, and wheat of other classes is reported as a percentage of total weight rounded to the nearest tenth of a percent. Country elevator managers often report wheat of other classes rounded to the nearest whole percent.

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[2]The elevator managers were not asked how they determined total defects. It was assumed that the managers sum the amounts reported for total damage, foreign material, and shrunken and broken kernels because that is the official procedure.

[3]The elevator managers were not asked how they determined a grade for wheat of other classes because it was assumed they used the same method for determining wheat of other classes as they used for contrasting classes.

Determination of a Numerical Grade

After test weight, total damage, heat damage, foreign material, shrunken and broken kernels, total defects, contrasting classes, and wheat of other classes are determined, a numerical grade can be assigned to the sample of wheat. The United States grading standards (Table 3) and the values reported for each numerical grade factor are used to determine a numerical grade (U.S. Grading Standards 1984). The grade factor with the lowest numerical grade is the determining factor, and the wheat cannot grade any higher than the numerical grade for that factor.

Determination of Nongrade Factors

Besides the grade factors, nongrade factors are important measurements of the general characteristics and quality of the wheat sample. Color, dockage, moisture, protein, and variety are nongrade factors.

Color

Color is an indication of quality in wheat and is an identification of the percentage of dark, hard vitreous kernels present in the wheat sample. For durum, there are three subclasses or color groups. Any sample of durum with 75 percent or more hard and vitreous kernels of amber color is subclassed "Hard Amber." Durum wheat with more than 60 percent but less than 75 percent amber-colored hard and vitreous kernels is subclassed "Amber." Durum wheat with less than 60 percent hard and vitreous kernels of amber color is subclassed "Durum." HRS wheat with 75 percent or more dark, hard and vitreous kernels is subclassed "Dark Northern Spring." HRS wheat with more than 25 percent but less than 75 percent dark, hard and vitreous kernels is subclassed "Northern Spring." HRS wheat with less than 25 percent dark, hard and vitreous kernels is subclassed "Red Spring Wheat."

Color determination was very similar for durum and very dissimilar for HRS wheat among the responding elevator managers. For durum, color was determined by visual inspection by 69 managers while the other 5 managers sent samples to a federally licensed inspection service (Table 7). For HRS wheat, 32 managers determined color by visual inspection, 2 managers sent samples to a federally licensed inspection service, and 43 managers did not determine color.

Officially, 100 grams of dockage-free wheat is used to determine color. The dark, hard vitreous kernels are removed by visual inspection and then weighed back (U.S. Grading Standards 1984). The percentage of the total weight determines the subclass.

Dockage

Dockage is an important indication of the quantity of clean wheat present in a sample of wheat. Dockage is all material which can be removed readily from a sample by use of an approved dockage tester in accordance with prescribed procedures (U.S. Grading Standards 1984). Dockage is composed of

stones, weed seeds, straw, and anything else that is separated by an approved dockage tester. Elevator managers were very similar in their methods of determining the dockage level in wheat. All 77 of the responding elevator managers determined dockage by machine (Table 7); 72 managers stated that they had a Carter dockage tester, and 5 managers had Emerson dockage testers (Table 8).

Officially, a sample of wheat is weighed, then fed into an approved dockage tester with the appropriate sieves and settings (U.S. Grading Standards 1984). After the machine has finished sorting, the clean wheat is weighed back and the percentage of the total weight missing is the percentage of dockage present in the sample. Officially, the percentage of dockage when equal to one-half percent or more is reported in terms of half percent, whole percent, or whole and half percent, as the case may be, with other fractions disregarded. For example, dockage ranging from 0.5 to 0.99 percent shall be expressed as 0.5 percent, from 1.0 percent to 1.49 percent as 1.0 percent, from 1.5 percent to 1.99 percent as 1.5 percent, etc.

Moisture

Moisture is an indication of the amount of water present in wheat, which means it is an indication of quantity of dry matter in wheat (Cramer and Heid 1983). Moisture level is also an indication of the storability of the wheat. Wheat with more than 13.5 percent moisture has to be dried or blended with drier wheat to facilitate storage.

The country elevators used similar methods for testing the moisture level in wheat. All 77 of the elevator managers tested moisture level by machine (Table 7). Motomco moisture testers are specifically listed as an approved device for testing moisture and were used by 51 of the elevators. Thirteen elevators used Burrows, 12 elevators used Steinlites and 1 elevator used a Neotec to test for moisture level (Table 8).

Officially an uncleaned sample of wheat is used to test for moisture content (U.S. Grading Standards 1984). Moisture level is reported as a percentage of total weight and is rounded to the nearest tenth of a percent.

Protein

Protein level also indicates wheat quality (Hyslop 1970). Generally, the higher the protein level in the wheat, the higher the quality of the flour. The level of protein influences loaf volume and the flour's ability to absorb water and resist physical breakdown under mechanical stress.

The elevator managers used very similar methods of testing for protein content in wheat. All 74 of the managers responding stated that they did not test durum for protein content (Table 7). For HRS wheat, 73 managers used a machine for testing protein content, and 4 managers sent a sample to a federally licensed inspection service. Among those that tested the HRS wheat themselves, 40 used a Neotec machine, 13 used a Infralyzer, 13 used a Dickey-John, 2 used a Udy, and 5 used a Trebor (Table 8).

The official method of testing protein content in wheat is a chemical analysis for nitrogen called the Kjeldahl method (U.S. Grading Standards 1984). Since this method takes over an hour for each sample, faster methods, such as the near-infared machine, have been approved as long as the machine is periodically tested against the Kjeldahl method. In the near-infared method, a handful of dockage-free wheat is ground into flour and placed into a dish, then into the machine. Because the level of moisture influences the protein level, the protein may be tested "as is" or at a specified moisture content. Protein is reported as a percentage of total weight rounded to the nearest tenth of a percent. The level of moisture is also listed. Seventy of the managers reported that they tested protein "as is" and three reported that they tested protein at 12 percent moisture. The fact that a sample of wheat with 14.5 percent protein and 13.0 percent moisture contains 16.67 percent protein at 0 percent moisture indicates that drier wheat has less protein (Cramer and Heid 1983).

Variety

Some varieties of wheat produce flour with certain milling and baking qualities to which traders may attach a premium or a discount. Vic durum is an example of a variety which occasionally gets a premium due to its inherent high quality.

Most elevator managers did not determine variety for durum or HRS wheat. For durum, 13 managers used visual inspection, 16 used a federally licensed inspection service, and 45 did not determine variety (Table 7). For HRS wheat, 6 managers used a visual inspection, one used a federally licensed inspection service, and 70 did not determine variety. Once variety is determined, it is reported.

Pricing Practices of Country Elevators with Regard to Grade and Nongrade Factors

After the grading of the wheat sample is completed and the results reported, the price for the wheat is determined. The price the elevator can pay is determined by the price it can receive for the wheat and the costs involved in handling and transporting the wheat to the destination market. Included in the price that the elevator pays for wheat are the premium and discount schedules which are determined in the market for the various grade and nongrade quality factors. In this section the practices of country elevators with regard to discounts and premiums for wheat quality are discussed.

Use of a Base Grade

Premiums and discounts are used to adjust price for quality variances of wheat. To facilitate the use of premiums and discounts, a base grade for wheat with prescribed quality is necessary. The market determines the price for the base grade as well as the premiums and discounts for wheat which does not fit the base grade. All of the managers surveyed used "#1 Hard Amber Durum, 13.5 percent moisture" as the base grade for durum. This base grade is used because it is the highest grade for durum and generally is the most

abundant. For instance, in 1984, 64 percent of the durum grown in North Dakota, Minnesota, Montana, and South Dakota graded "#1 Hard Amber Durum" (Dick, et al. 1982). All 77 of the managers responding used "#1 Dark Northern Spring, 14 percent protein, 13.5 percent moisture" as the base grade for HRS wheat. This base grade is used because "#1 Dark Northern Spring" is the highest grade available and generally the most abundant. The 14 percent protein level is used because it is about the average protein level for HRS wheat. In 1984, 49 percent of all HRS wheat produced in North Dakota, Minnesota, Montana, and South Dakota was "#1 Dark Northern Spring" and the average "as is" protein level was 14.7 percent (D'Appolonia et al. 1984).

Determining Premium and Discount Schedules

Country elevator managers commented on how they determined the premium and discount schedules they used for durum and HRS wheat. For durum, 72 of the managers stated they used the premium and discount schedules determined in the market. The remaining 2 managers stated that they used their own schedules but that these schedules were similar to those determined in the market. For HRS wheat, 75 managers stated that they used the premium and discount schedules determined in the market, and 2 managers stated that they used their own schedules but that their schedules did not differ from those determined in the market.

The methods used by the country elevators to adjust price for each grade and nongrade factor and whether or not the discounts had changed since harvest are discussed next. Discounts given were for December 1984 and may have changed since then. Adjustments to price given were examined to determine whether they varied with location of the elevator in the state (eastern and western); storage capacity of the elevator (more or less than 300,000 bushels); loadout capacity of the elevator (more or less than 13-car maximum loadout capacity); distance to competition (more and less than 5 miles); organizational structure of the elevator; and board price of the elevator for durum and HRS wheat (high and low board prices). A two-tailed statistical test with a .025 significance level was used for each test.

Test Weight

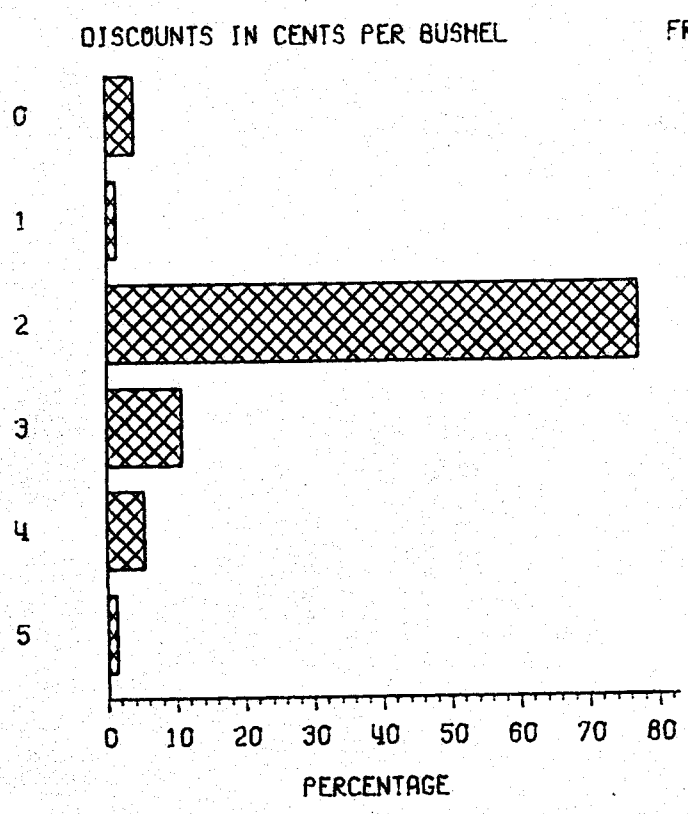
Test weight for most managers was an important factor in adjusting price for wheat. For durum, 66 managers responded that they always adjusted price due to test weight, 7 managers sometimes adjusted price due to test weight, and 1 manager never adjusted price due to test weight (Table 9). For HRS wheat, 54 managers stated that they always adjusted price due to test weight, 20 managers sometimes adjusted price due to test weight, and 3 managers never adjusted price due to test weight.

Each elevator manager gave his test weight discount schedule for durum and HRS wheat. No test weight premium schedules were given. These discount schedules were used to calculate the discount given for 58 lb. durum and 57 lb. HRS wheat (No. 2 grade). To make No. 1 grade, durum and HRS wheat must have 60 lb. and 58 lb. test weights, respectively. Among the 74 responses the average discount given for 58 lb. durum was 2.2 cents per bushel (see Figure 3 for frequency distribution). Among the 77 responses the average discount for 57 lb. HRS wheat was 1.9 cents per bushel (see Figure 4 for frequency

TABLE 9. FREQUENCY OF TESTING SPECIFIED GRADE AND NONGRADE FACTORS FOR DURUM AND HRS WHEAT AMONG SELECTED NORTH DAKOTA ELEVATORS, (DECEMBER 1984)

Commodity	Grading Factor	Always		Sometimes		Never	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Durum	Test weight	66	89.2	7	9.4	1	1.4
	Total damage	65	87.8	8	10.8	1	1.4
	Foreign material	47	63.5	12	16.2	15	20.3
	Shrunken & broken kernels	49	66.2	13	17.6	12	16.2
	Contrasting classes	65	87.8	8	10.8	1	1.4
	Dockage	0	0.0	0	0.0	74	100.0
	Moisture	56	75.7	12	16.2	6	8.1
	Protein	0	0.0	4	5.4	70	94.6
	Color	73	98.6	0	0.0	1	1.4
	Variety	2	2.7	23	31.1	49	66.2
HRS Wheat	Test weight	54	70.1	20	26.0	3	3.9
	Total damage	51	66.2	23	29.9	3	3.9
	Foreign material	39	50.6	23	29.9	15	19.5
	Shrunken & broken kernels	33	42.8	25	32.5	19	24.7
	Contrasting classes	47	61.0	23	29.9	7	9.1
	Dockage	0	0.0	0	0.0	77	100.0
	Moisture	51	66.2	20	26.0	6	7.8
	Protein	75	97.4	2	2.6	0	0.0
	Color	15	19.5	28	36.4	34	44.1
	Variety	0	0.0	3	3.9	74	96.1

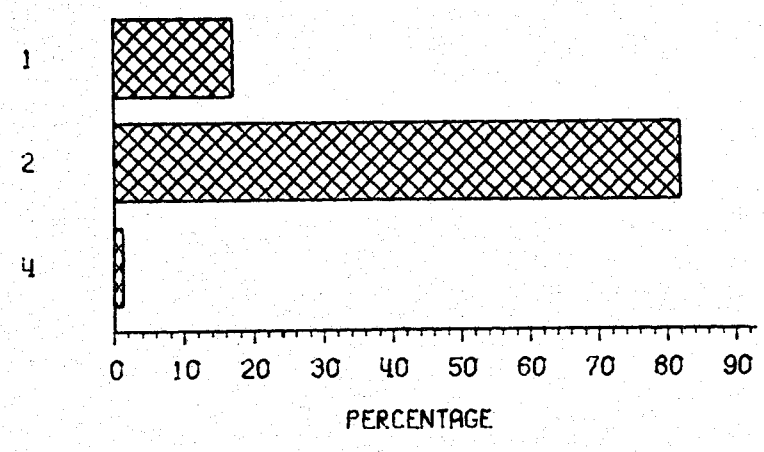
SOURCE: Questions III. HRS Wheat 2 and III. Durum 2.



DISCOUNTS IN CENTS PER BUSHEL	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
0	3	3	4.05	4.05
1	1	4	1.35	5.41
2	57	61	77.03	82.43
3	8	69	10.81	93.24
4	4	73	5.41	98.65
5	1	74	1.35	100.00

Figure 3. Frequency of Test Weight Discounts for 58 lb. Durum Among Selected Country Elevators in North Dakota (December 1984)

SOURCE: Question III. Durum 4.1.



DISCOUNTS IN CENTS PER BUSHEL	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
1	13	13	16.88	16.88
2	63	76	81.82	98.70
4	1	77	1.30	100.00

Figure 4. Frequency of Test Weight Discounts for 57 lb. HRS Wheat Among Selected Country Elevators in North Dakota (December 1984)

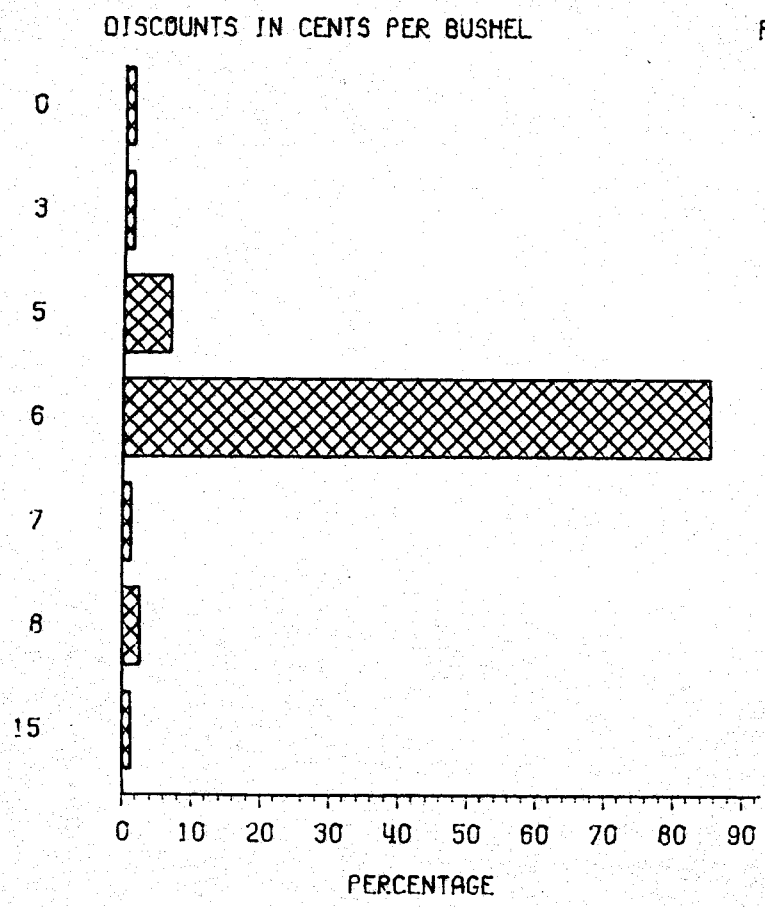
SOURCE: Question III. HRS Wheat 4.1.

distribution). Although the discounts for test weight did vary among the elevators responding, the average test weight discounts did not vary significantly among elevators with respect to location in the state, storage capacity, loadout capacity, distance to competition, or board prices. Test weight discounts had not significantly changed since harvest, according to the elevator managers.

Total Damage

For most managers total damage was an important factor in adjusting price for wheat. For durum, 65 managers always adjusted price due to the percentage of total damaged kernels, 8 managers sometimes adjusted price and 1 manager never adjusted price due to the percentage of total damaged kernels (Table 9). For HRS wheat, 51 managers always adjusted price, 23 managers sometimes did, and 3 managers never adjusted price.

Each elevator manager gave his total damage discount schedule for durum and HRS wheat. The 4 percent total damage (#2 grade) discounts for durum and HRS wheat could be calculated from these schedules. The average discount for 4 percent total damaged durum among the 74 responses was 6.0 cents per bushel (see Figure 5 for frequency distribution). The average discount for 4 percent



DISCOUNTS IN CENTS PER BUSHEL	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
0	1	1	1.35	1.35
3	1	2	1.35	2.70
5	5	7	6.76	9.46
6	63	70	85.14	94.59
7	1	71	1.35	95.95
8	2	73	2.70	98.65
15	1	74	1.35	100.00

Figure 5. Frequency of Damage Discounts for 4 Percent Total Damage Durum Among Selected Country Elevators in North Dakota (December 1984)

SOURCE: Question III. Durum 4.6.

total damaged HRS wheat among the 77 responses was 2.0 cents per bushel (see Figure 6 for frequency distribution). Although the elevators did vary in their total damage discounts, the average total damage discount did not vary significantly by location in the state, storage capacity, organizational structure, loadout capacity, distance to competition, or board price. Total damage discounts had not changed significantly since harvest according to the managers' responses.

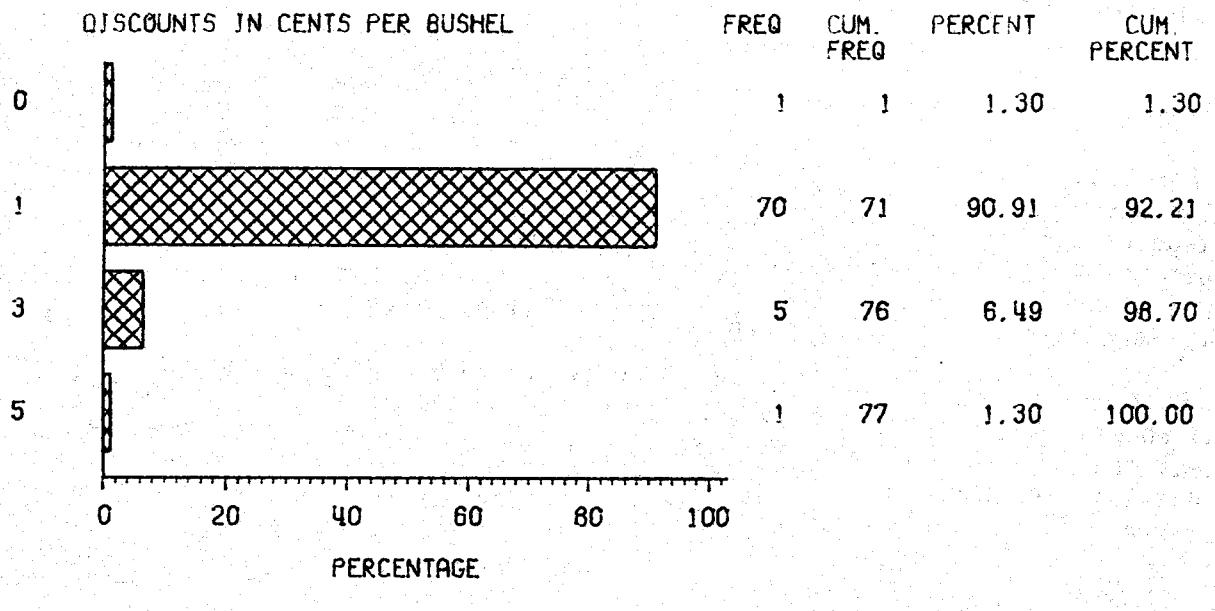


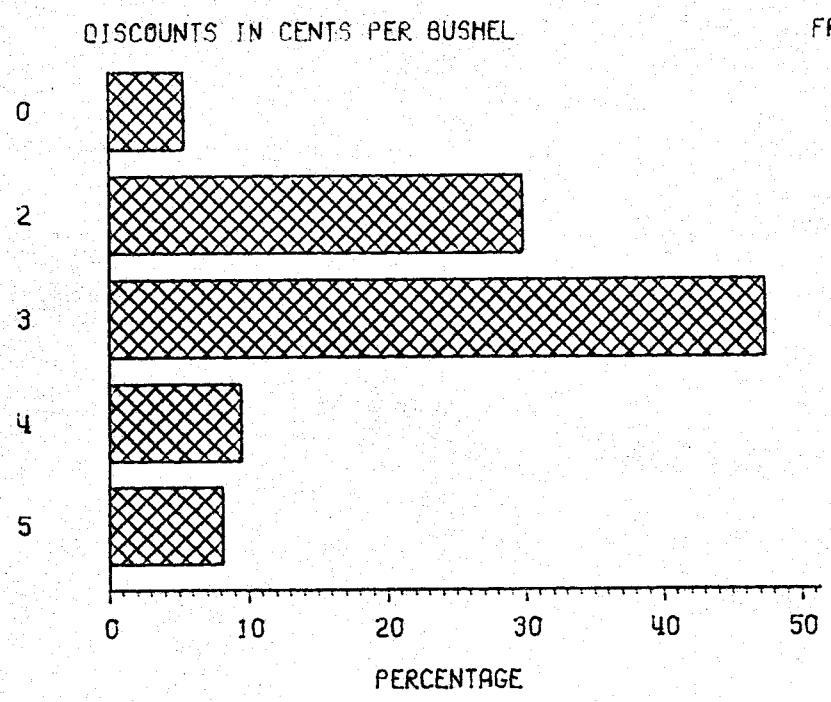
Figure 6. Frequency of Damage Discounts for 4 Percent Total Damage HRS Wheat Among Selected Country Elevators in North Dakota (December 1984)

SOURCE: Question III. HRS Wheat 4.6.

Foreign Material

Foreign material was an important pricing factor among most of the elevator managers for durum and HRS wheat. For durum, 47 managers always adjusted price due to the level of foreign material, 12 sometimes did, and 15 never did (Table 9). For HRS wheat, 39 managers always adjusted price, 23 managers sometimes did, and 15 managers never adjusted price.

Each manager gave his foreign material discount schedule for durum and HRS wheat. The durum and HRS wheat discounts for 1 percent foreign material (#2 grade) were calculated from the discount schedules given. The average discount for 1 percent foreign material durum among the 74 responses was 2.8 cents per bushel (see Figure 7 for frequency distribution). The average discount for 1 percent foreign material HRS wheat among the 77 responses was 1.4 cents per bushel (see Figure 8 for frequency distribution). Although the foreign material discounts varied among the elevators responding, no significant differences were found by location in the state, storage capacity, organizational structure, loadout capacity, distance to competition, or board price. According to the managers' responses, the discounts for foreign material had not changed significantly since harvest.



DISCOUNTS IN CENTS PER BUSHEL	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
0	4	4	5.41	5.41
2	22	26	29.73	35.14
3	35	61	47.30	82.43
4	7	68	9.46	91.89
5	6	74	8.11	100.00

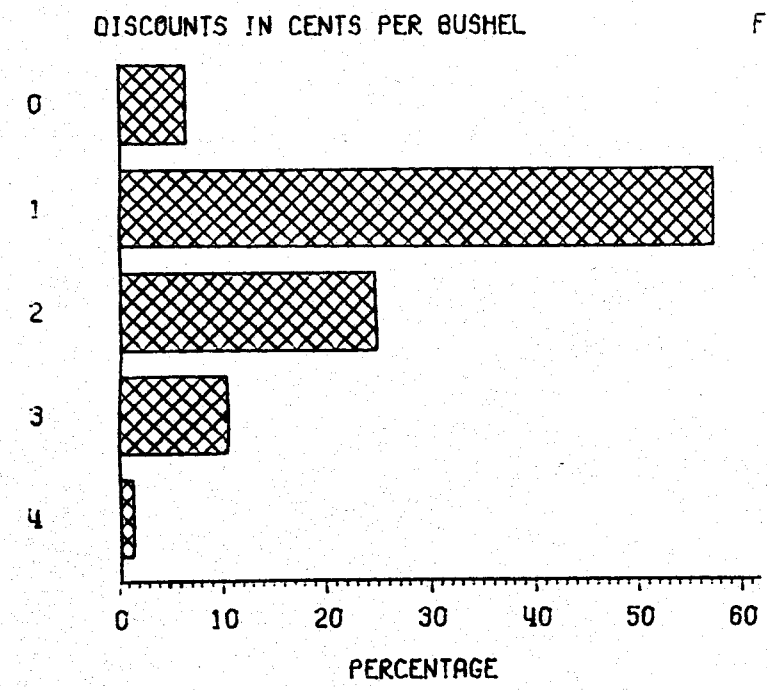
Figure 7. Frequency of Discounts for 1 Percent Foreign Material Durum Among Selected Country Elevators in North Dakota (December 1984)

SOURCE: Question III. Durum 4.7.

Shrunken and Broken Kernels

Shrunken and broken kernels was an important pricing factor for durum and HRS wheat among the elevator managers. For durum, 49 managers stated that they always adjusted price due to the percentage of shrunken and broken kernels, 13 managers stated that they sometimes did, and 12 managers never did (Table 9). For HRS wheat, 33 managers always adjusted price, 25 managers sometimes did, and 19 managers never did.

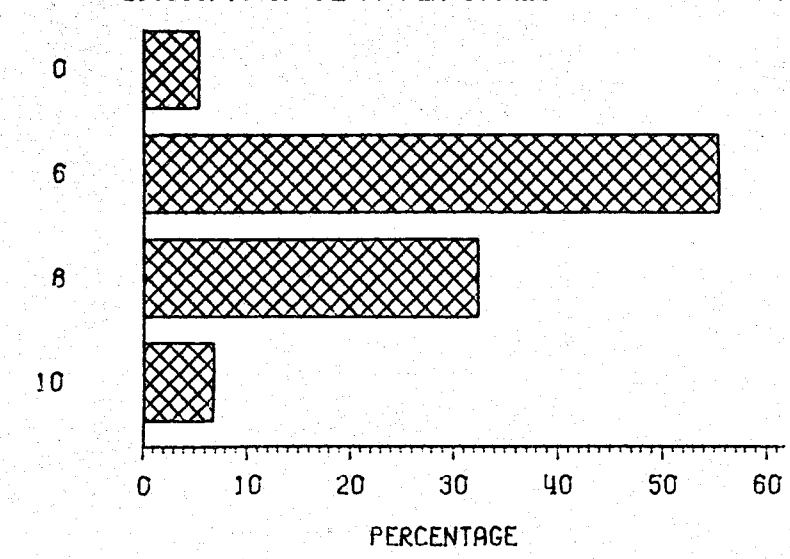
Each elevator manager gave his discount schedules for shrunken and broken kernels for durum and HRS wheat. The durum and HRS wheat discounts for 5 percent shrunken and broken kernels (No. 2 grade) were calculated from the discount schedules given. The average discount for 5 percent shrunken and broken durum among the 74 responses was 6.6 cents per bushel (see Figure 9 for frequency distribution). The average discount for 5 percent shrunken and broken HRS wheat among the 77 responses was 2.2 cents per bushel (see Figure 10 for frequency distribution). Although the discounts for shrunken and broken kernels did vary among the elevators, the average discounts did not vary significantly by location in the state, storage capacity, organization structure, loadout capacity, distance to competition, or board price. According to the responses of the elevator managers, the discounts for shrunken and broken kernels had not significantly changed since harvest.



DISCOUNTS IN CENTS PER BUSHEL	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
0	5	5	6.49	6.49
1	44	49	57.14	63.64
2	19	68	24.68	88.31
3	8	76	10.39	98.70
4	1	77	1.30	100.00

Figure 8. Frequency of Discounts for 1 Percent Foreign Material HRS Wheat Among Selected Country Elevators in North Dakota (December 1984)

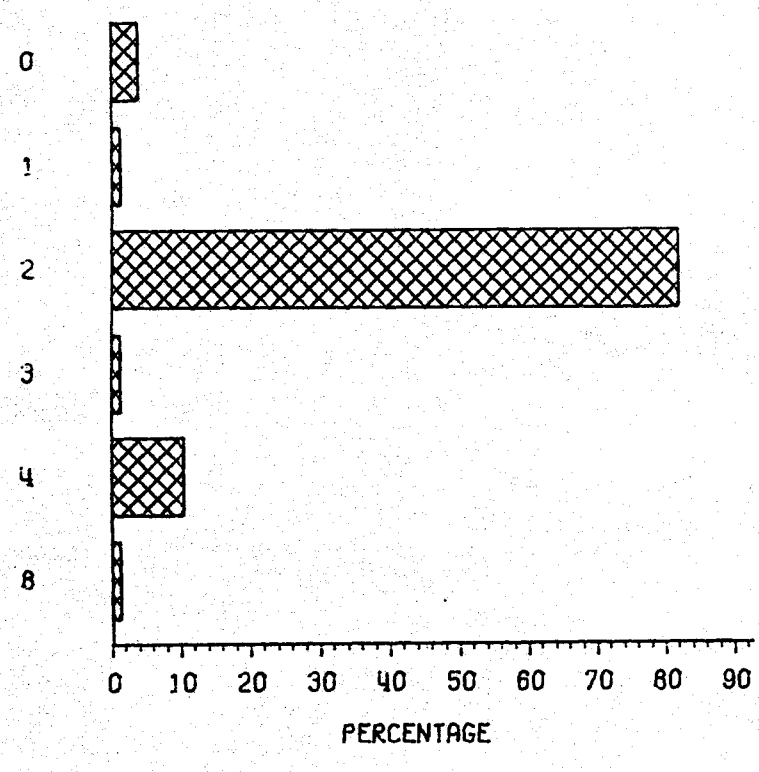
SOURCE: Question III. HRS Wheat 4.7.



DISCOUNTS IN CENTS PER BUSHEL	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
0	4	4	5.41	5.41
6	41	45	55.41	60.81
8	24	69	32.43	93.24
10	5	74	6.76	100.00

Figure 9. Frequency of Discounts for 5 Percent Shrunken & Broken Durum Among Selected Country Elevators in North Dakota (December 1984)

SOURCE: Question III. Durum 4.8.



DISCOUNTS IN CENTS PER BUSHEL	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
0	3	3	3.90	3.90
1	1	4	1.30	5.19
2	63	67	81.82	87.01
3	1	68	1.30	88.31
4	8	76	10.39	98.70
8	1	77	1.30	100.00

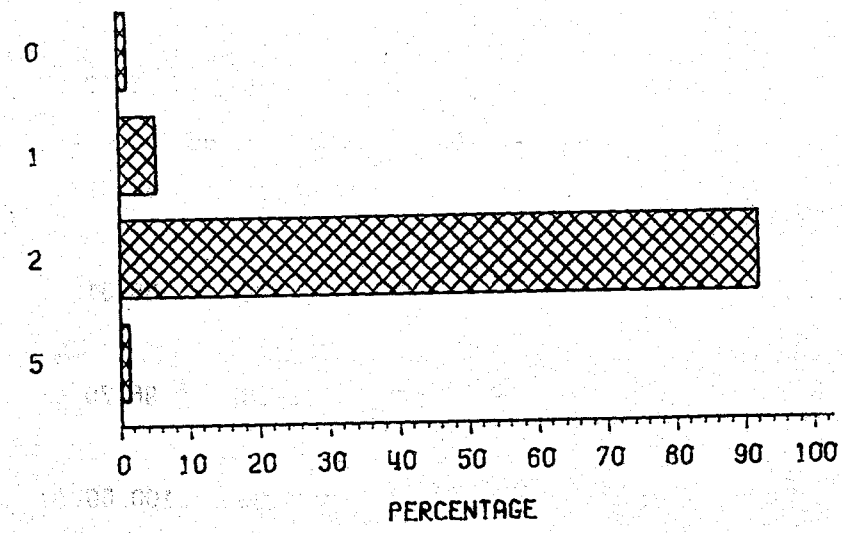
Figure 10. Frequency of Discounts for 5 Percent Shrunken & Broken HRS Wheat Among Selected Country Elevators in North Dakota (December 1984)

SOURCE: Question III. HRS Wheat 4.8.

Contrasting Classes

Contrasting classes was an important pricing factor for durum and HRS wheat among most of the elevator managers. For durum, 65 managers stated that they always adjusted price due to the level of contrasting classes, 8 managers sometimes adjusted price, and 1 manager never adjusted price (Table 9). For HRS wheat, 47 managers stated that they always adjusted price, 23 managers said they sometimes did, and 7 managers never did.

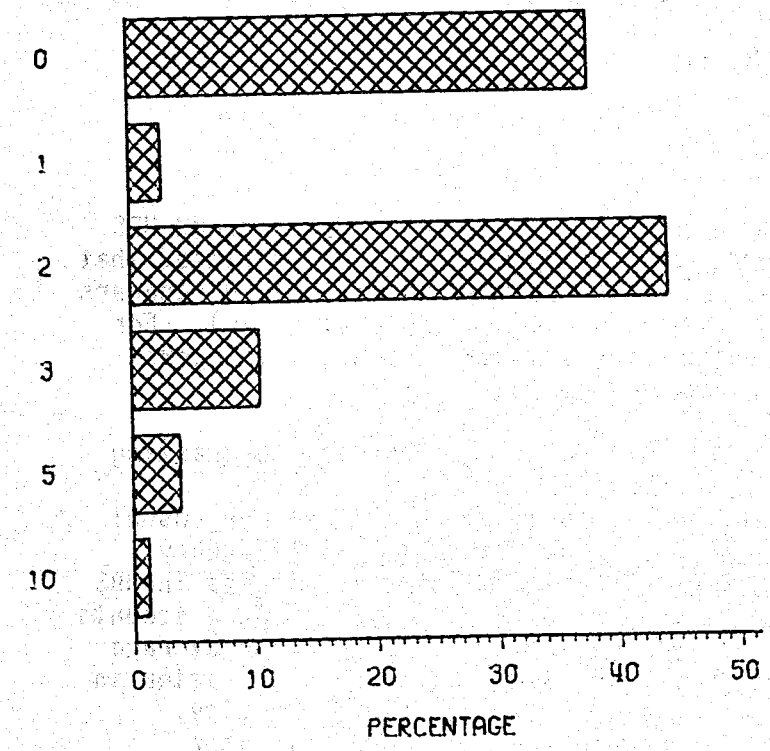
Each manager was asked to give his discount schedules for contrasting classes in durum and HRS wheat. The average discount for 2 percent contrasting classes in durum among the 74 responses was 2.0 cents per bushel (see Figure 11 for frequency distribution). (See Figure 12 for frequency distribution.) The average discount for 2 percent contrasting classes in HRS wheat among the 77 responses was 1.6 cents per bushel. Although the discounts for contrasting classes did vary among the responding elevators, the average discounts for contrasting classes did not vary significantly with location in the state, storage capacity, organizational structure, loadout capacity, distance to competition, or price. According to the responding elevator managers, the discount schedule for contrasting classes had not significantly changed since harvest.



	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
0	1	1	1.35	1.35
1	4	5	5.41	6.76
2	68	73	91.89	98.65
5	1	74	1.35	100.00

Figure 11. Frequency of Discounts for 2 Percent Contrasting Classes of Durum Among Selected Country Elevators in North Dakota (December 1984)

SOURCE: Question III. Durum 4.9.



	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
0	29	29	37.66	37.66
1	2	31	2.60	40.26
2	34	65	44.16	84.42
3	8	73	10.39	94.81
5	3	76	3.90	98.70
10	1	77	1.30	100.00

Figure 12. Frequency of Discounts for 2 Percent Contrasting Classes of HRS Wheat Among Selected Country Elevators in North Dakota (December 1984)

SOURCE: Question III. HRS Wheat 4.9.

Color

Color is an important pricing factor for durum for most managers but relatively unimportant as a pricing factor for HRS wheat. For durum, all but one manager stated that they always adjusted price due to color (Table 9). For HRS wheat 15 managers always adjusted price due to color, 28 managers sometimes did, and 34 managers never did.

Each manager gave the discount schedules he used for discounting durum and HRS wheat for color. The average discount for durum wheat in the "amber durum" subclass among the 74 responses was 5.7 cents per bushel (see Figure 13 for frequency distribution). The average discount for durum wheat in the "durum" subclass among the 74 responses was 11.7 cents per bushel (see Figure 14 for frequency distribution). No color discounts schedules were used for HRS wheat. Although the discounts for color did vary among elevators, no significant difference in the average mean discounts could be found between locations in the state, storage capacity, organizational structure, loadout capacity, distance to competition, or board price. According to the responses of the managers the discount schedule for durum color had not changed since harvest.

Dockage

Dockage is not an important factor in adjusting price for durum and HRS wheat but is an important quantity adjustment which affects the producer's revenue. All of the managers stated that they never adjusted price due to

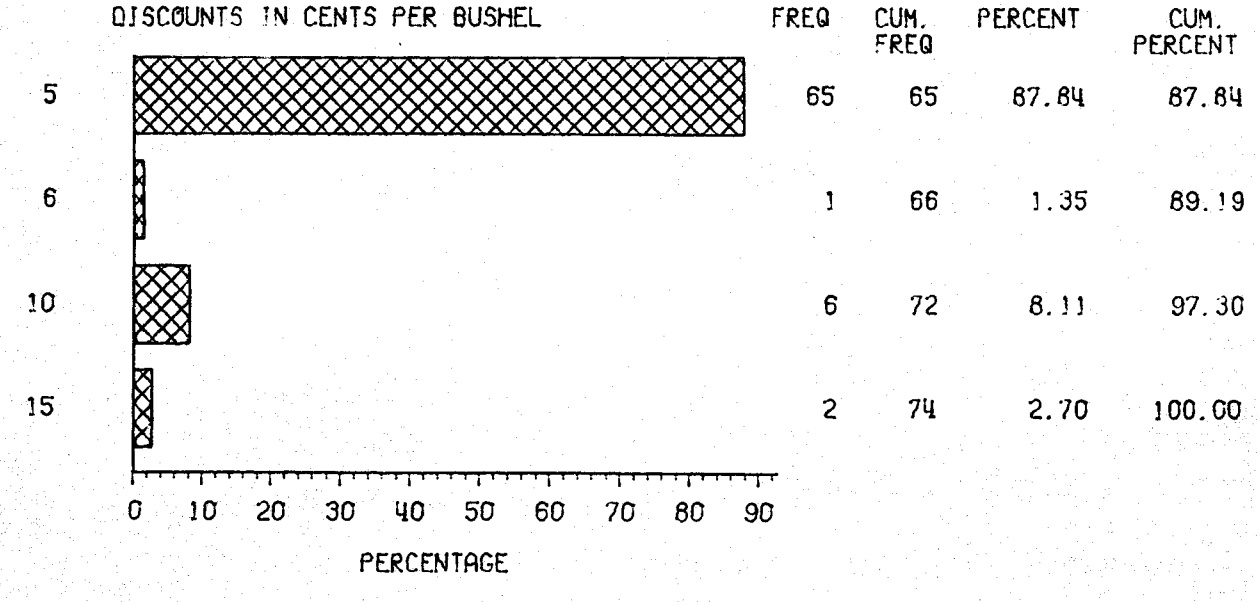
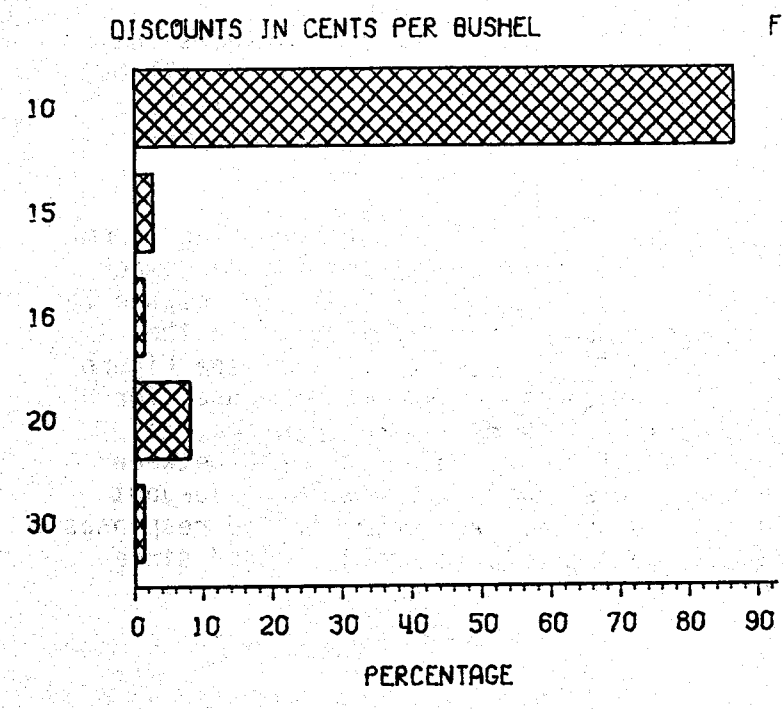


Figure 13. Frequency of Color Discounts for Durum (Amber Durum) Among Selected Country Elevators in North Dakota (December 1984)

SOURCE: Question III. Durum 4.5.



DISCOUNTS IN CENTS PER BUSHEL	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
10	64	64	86.49	86.49
15	2	66	2.70	89.19
16	1	67	1.35	90.54
20	6	73	8.11	98.65
30	1	74	1.35	100.00

Figure 14. Frequency of Color Discounts for Durum (Durum) Among Selected Country Elevators in North Dakota (December 1984)

SOURCE: Question III. Durum 4.5.

dockage in durum and HRS wheat (Table 9). None of the managers used dockage discount schedules for durum or HRS wheat. Instead, the managers indicated that they made quantity adjustments due to the level of dockage. The percentage of dockage found in the test sample is deducted from the total weight leaving the farmer to be paid only for the clean wheat he delivered. Thus, the farmer is paid only for the wheat and not for the dockage in the wheat.

Moisture

Moisture is an important price adjustment factor or quantity adjustment for durum and HRS wheat. For durum, 56 managers always adjusted price due to moisture, 12 managers sometimes did, and 6 managers never did (Table 9). For HRS wheat 51 managers always adjusted price due to moisture level, 20 sometimes did, and 6 managers never did. Several managers used a quantity adjustment rather than a price adjustment.

Discounting wheat due to moisture level is done because the percentage of moisture affects the quantity and storability of wheat. Discounting of wheat occurs only to wheat above 13.5 percent moisture because wheat below 13.5 percent moisture can be stored safely. Wheat over 13.5 percent moisture has to be either dried or blended with dry wheat to facilitate storage. Drying wheat results in weight loss due to the reduction in moisture content and the loss of fines and dust.

Two methods can be used by the elevator to compensate for the loss in weight from drying. One method is called shrinkage. Minary charts (Table 10) which show the percentage of weight lost due to drying wheat of various moisture levels down to acceptable levels are used to figure shrinkage (Hirning 1985). The elevator takes the reported moisture, reads the chart, and subtracts the percentage of shrinkage from the amount of clean wheat. For example a farmer brings in a 50,000 lb. load of durum wheat with 5 percent dockage and 16 percent moisture. The elevator manager would first subtract the dockage (leaving 47,500 lbs), and then subtract the shrinkage from drying 16 percent wheat down to 13.5 percent, or 3.15 percent shrinkage (leaving 46,004 lbs). The farmer would get paid base price (assuming no other

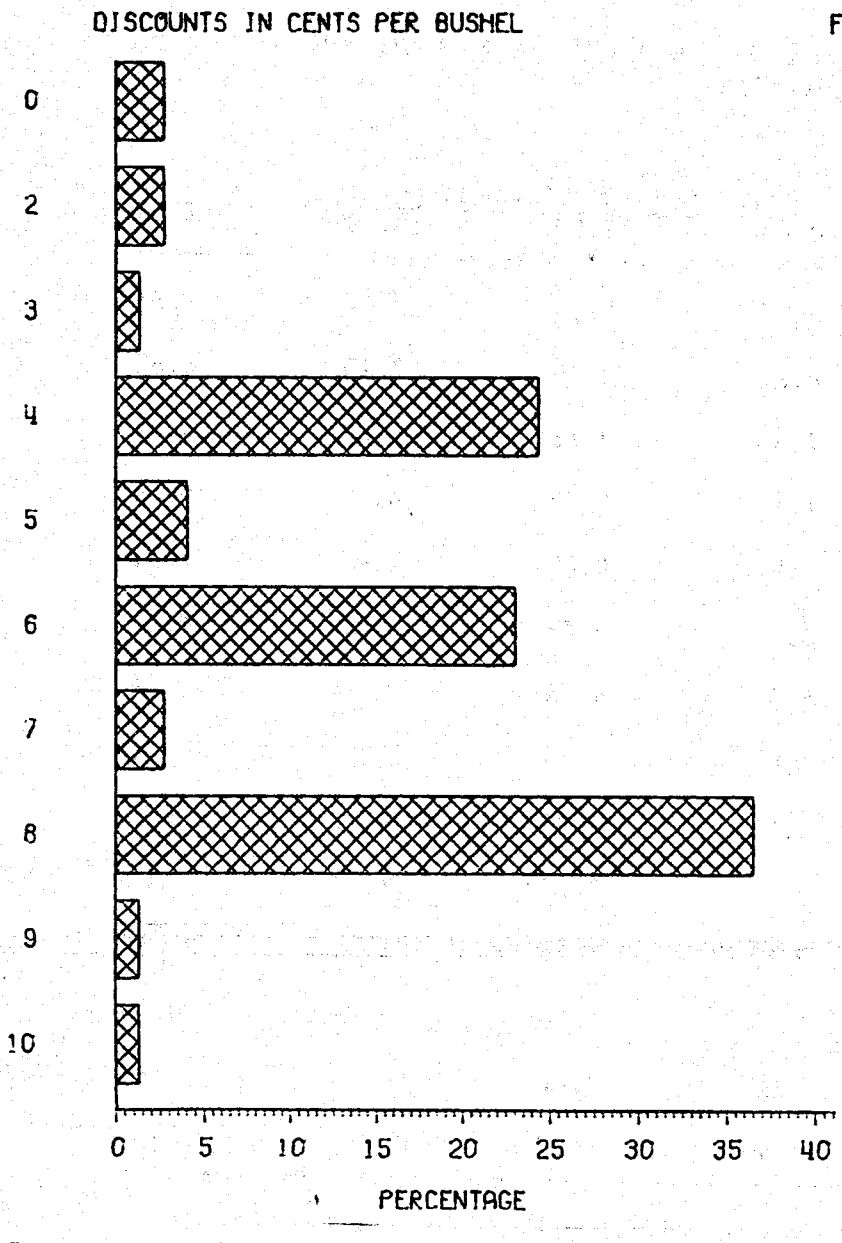
TABLE 10. PERCENTAGE OF SHRINKAGE DUE TO DRYING WHEAT FROM INITIAL MOISTURE TO FINAL MOISTURE PERCENTAGES

Initial Moisture Percentage	Final Moisture Percentage				
	12.00	12.50	13.00	13.50	14.00
20.0	9.35	8.83	8.30	7.77	7.23
19.5	8.78	8.25	7.73	7.19	6.65
19.0	8.21	7.68	7.15	6.61	6.07
18.5	7.64	7.11	6.58	6.04	5.49
18.0	7.07	6.54	6.00	5.46	4.91
17.5	6.5	5.97	5.43	4.88	4.32
17.0	5.94	5.4	4.85	4.30	3.74
16.5	5.37	4.83	4.28	3.72	3.16
16.0	4.8	4.25	3.70	3.15	2.58
15.5	4.25	3.68	3.13	2.57	2.00
15.0	3.66	3.11	2.55	1.99	1.42
14.5	3.10	2.54	1.98	1.41	0.84
14.0	2.53	1.97	1.40	0.83	--
13.5	1.96	1.40	0.83	--	--

SOURCE: "Grain Drying Tables" Harvey Hirning, Extension Agricultural Engineer, North Dakota State University

discounts apply) times the amount of dry weight in bushels. The second method of adjusting price due to moisture is to adjust price with moisture discounts which approximate the value of the percentage of weight lost due to drying. Moisture discounts for wheat are determined in the market.

The elevator managers either gave their schedule of moisture discounts for durum and HRS wheat or calculated the per bushel value of shrinkage. No premiums were given for dry grain. From the responses, the moisture discounts for 14.5 percent moisture durum and HRS wheat were determined. The average discount for 14.5 percent moisture durum among the 74 responses was 6.0 cents per bushel (see Figure 15 for frequency distribution). The average



DISCOUNTS IN CENTS PER BUSHEL	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
0	2	2	2.70	2.70
2	2	4	2.70	5.41
3	1	5	1.35	6.76
4	18	23	24.32	31.08
5	3	26	4.05	35.14
6	17	43	22.97	58.11
7	2	45	2.70	60.81
8	27	72	36.49	97.30
9	1	73	1.35	98.65
10	1	74	1.35	100.00

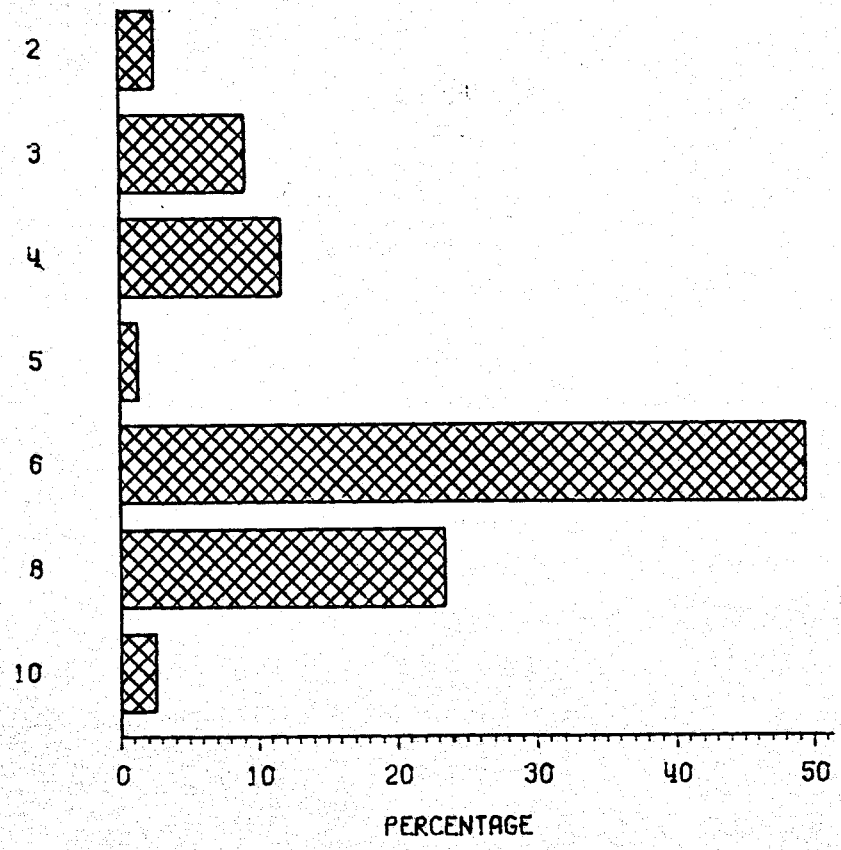
Figure 15. Frequency of Moisture Discounts for 14.5 Percent Moisture Durum Among Selected Country Elevators in North Dakota (December 1984)

SOURCE: Question III. Durum 4.2.

discount for 14.5 percent HRS wheat among the 77 responses was 5.9 cents per bushel (see Figure 16 for frequency distribution). Although the moisture discounts did vary among the responding elevators, the average moisture discounts did not vary significanty with location in the state, storage capacity, organizational structure, loadout capacity, distance to competition, or board price. The responses of the elevator managers indicated that discounts for moisture had not significantly changed since harvest.

Protein was an important pricing factor for HRS wheat but not for durum among the elevator managers. For durum, all 74 managers never adjusted price due to protein level (Table 9). For HRS wheat, 75 managers stated that they always adjusted price due to protein level and 2 managers sometimes did.

The managers were asked to give their protein discount and premium schedules for durum and HRS wheat. None of the managers used a protein premium or discount schedule for durum. Protein premium and discount



DISCOUNTS IN CENTS PER BUSHEL	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
2	2	2	2.60	2.60
3	7	9	9.09	11.69
4	9	18	11.69	23.38
5	1	19	1.30	24.68
6	38	57	49.35	74.03
8	18	75	23.38	97.40
10	2	77	2.60	100.00

Figure 16. Frequency of Moisture Discounts for 14.5 Percent Moisture HRS Wheat Among Selected Country Elevators in North Dakota (December 1984)

SOURCE: Question III. HRS Wheat 4.2.

schedules were given for HRS wheat. The premium for 16 percent protein and the discount for 12 percent protein HRS wheat from 14 percent HRS wheat were calculated from the schedules given. The average premium for 16 percent HRS wheat among the 77 responses was 41.0 cents per bushel (see Figure 17 for frequency distribution). The average discount for 12 percent HRS wheat among the 77 responses was 38.0 cents per bushel (see Figure 18 for frequency distribution).

Although the protein premiums and discounts varied among the responding elevators, average protein premiums and discounts did not vary significantly with storage capacity, organizational structure, loadout capacity or board price. Significant differences were found among the average protein price adjustments between elevators in eastern and western North Dakota (Table 11). The difference in protein price adjustments between the east and west can be linked to the supply of protein and protein price adjustments at the elevators. This difference in price adjustment demonstrates the market's method of communication with the producer on the supply and demand for protein. The responses from the elevator managers indicated that their price adjustments due to protein change as the market changes and thus have changed since harvest.

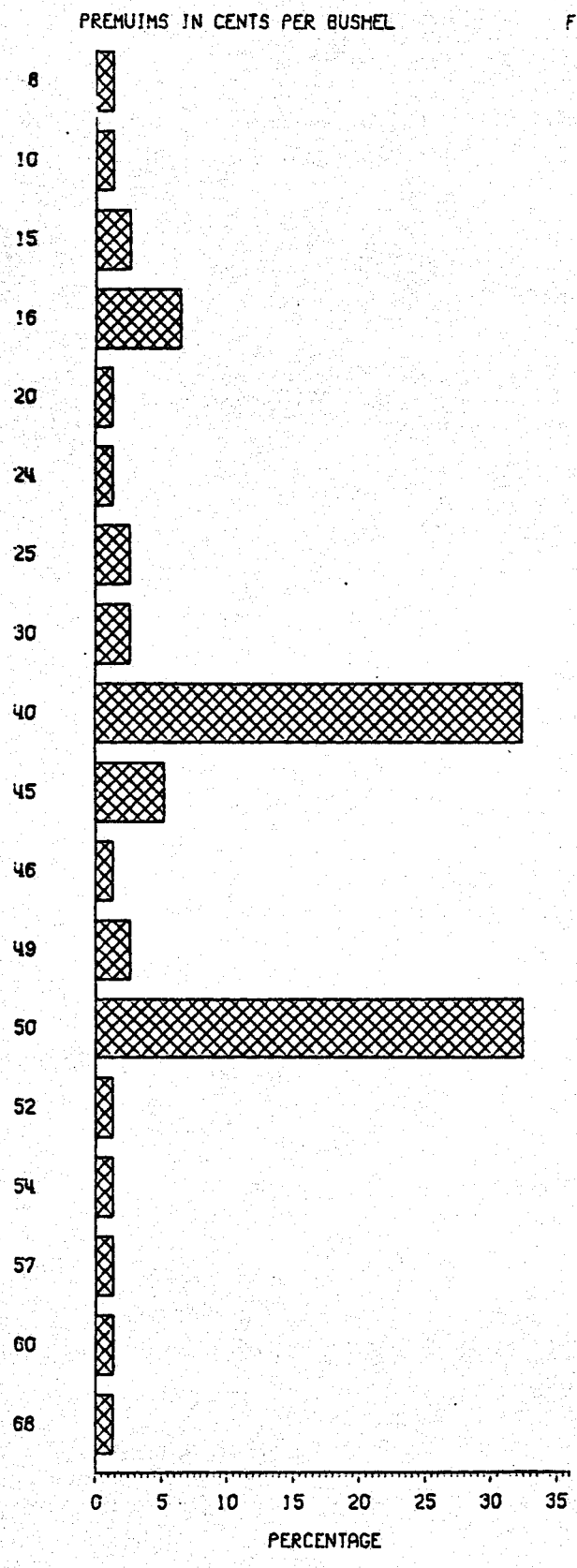
Variety

Variety is not an important pricing factor for durum and HRS wheat among most of the elevator managers responding. For durum, 2 managers indicated that they always adjusted price due to variety, 23 managers sometimes did, and 49 managers never did (Table 9). For HRS wheat, 3 managers sometimes adjusted price due to variety, 74 managers never did. No premium or discount schedules for durum or HRS wheat were being used by the elevator managers for variety.

Price Adjustments on Purchasing Contracts

Contracts are often used between country elevators and producers. The handling of discounts and premiums can affect the price received by producers. Two of the most common forms of contracts used are forward and no-price-established contracts (Rhodes 1978). Forward contracts allow producers to lock in a price rather than risk what the price will be at the time of marketing. A no-price-established contract occurs when a producer hauls his wheat into the elevator and passes title to the elevator but waits to price and collect payment at a later date. The producer selects the date of pricing, and the prevailing price on that date determines the contract price.

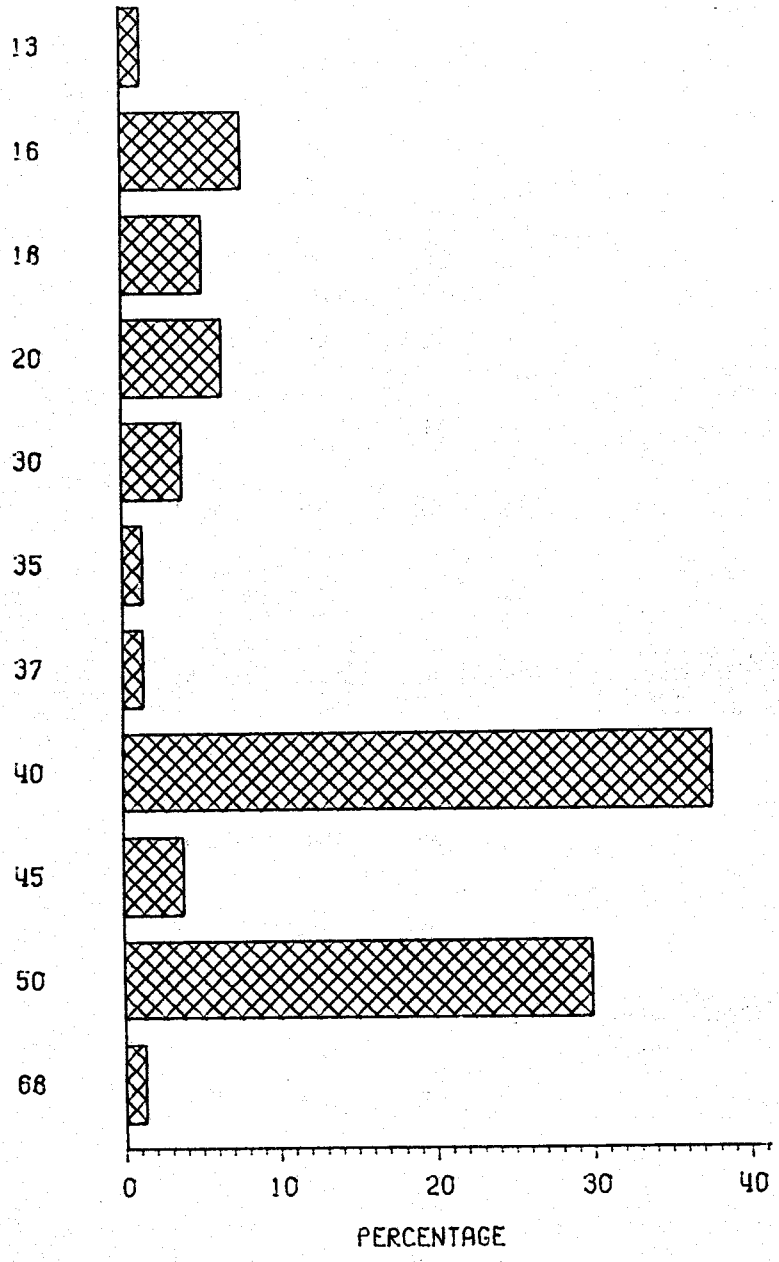
The time of determining premium and discount schedules is an important pricing factor for the elevator and the producer. Because premium and discount schedules are determined in the market, the risk of premium and discount schedule changes is present. Determining premium and discount schedules at the time of contracting places the risk of premium and discount schedule changes on the elevator, whereas determining premium and discount schedules at delivery or at the time of pricing places the risk of premium and discount schedule changes on the producer.



PREMUIMS IN CENTS PER BUSHEL	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
8	1	1	1.30	1.30
10	1	2	1.30	2.60
15	2	4	2.60	5.19
16	5	9	6.49	11.69
20	1	10	1.30	12.99
24	1	11	1.30	14.29
25	2	13	2.60	16.88
30	2	15	2.60	19.48
40	25	40	32.47	51.95
45	4	44	5.19	57.14
46	1	45	1.30	58.44
49	2	47	2.60	61.04
50	25	72	32.47	93.51
52	1	73	1.30	94.81
54	1	74	1.30	96.10
57	1	75	1.30	97.40
60	1	76	1.30	98.70
68	1	77	1.30	100.00

Figure 17. Frequency of Protein Premiums for 16 Percent Protein HRS Wheat Among Selected Country Elevators in North Dakota (December 1984)

SOURCE: Question III. HRS Wheat 4.4.



DISCOUNTS IN CENTS PER BUSHEL	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
13	1	1	1.30	1.30
16	6	7	7.79	9.09
18	4	11	5.19	14.29
20	5	16	6.49	20.78
30	3	19	3.90	24.68
35	1	20	1.30	25.97
37	1	21	1.30	27.27
40	29	50	37.66	64.94
45	3	53	3.90	68.83
50	23	76	29.87	98.70
68	1	77	1.30	100.00

Figure 18. Frequency of Protein Discounts for 12 Percent Protein HRS Wheat Among Selected Country Elevators in North Dakota (December 1984)

SOURCE: Question III. HRS Wheat 4.4.

TABLE 11. AVERAGE HIGH AND LOW PROTEIN PREMIUMS AND DISCOUNTS FOR EASTERN AND WESTERN NORTH DAKOTA ELEVATORS, (DECEMBER 1984)

Factor	Location	Average	Low	High
Premium from 14% to 16% protein	East	44	15	68
	West	19	8	40
Discount from 14% to 12% protein	East	-41	-13	-68
	West	-20	-16	-40

SOURCE: Question III. 4.4

Half of the elevator managers using forward contracts stated that the producer rather than the elevator assumed the risk of premium and discount schedule changes for forward contracts. Thirty-six managers indicated that premium and discount schedules for durum were determined at the time of contracting, and twenty-eight managers indicated that they were determined at the time of delivery; ten managers indicated that they did not offer forward contracts for durum. Twenty-seven managers stated that premium and discount schedules for forward contracts for HRS wheat were determined at time of contracting, and forty-one managers indicated that premium and discount schedules were determined at time of pricing; nine managers did not use forward contracts for HRS wheat.

Over half of the managers using no-price-established contracts stated that the producer rather than the elevator assumed the risk of premium and discount schedule changes for no-price-established contracts. Nineteen managers indicated that premium and discount schedules for durum were determined at time of contracting while twenty-seven managers indicated that premium and discount schedules were determined at the time of pricing. Twenty-eight managers did not use no-price-established contracts for durum. Seventeen managers stated that premium and discount schedules for HRS were determined at time of contracting, and thirty-six managers stated that premium and discount schedules were determined at time of pricing. Twenty-four managers did not use no-price-established contracts for HRS wheat.

Conditioning of Grain by Country Elevators

A major function of the country elevator is to condition grain for shipment to destination markets. Included in conditioning are drying, cleaning, blending, and binning of grain. The conditioning practices of the responding elevators are discussed in this section.

Drying of Wheat

To facilitate safe storage, wheat has to be dried to at least 13.5 percent moisture. When asked about what type of dryers they had, 33 managers stated that they had continous flow dryers, 6 managers had batch dryers, 2 managers had aeration dryers, and 36 managers did not have dryers. The percentage of elevators in eastern North Dakota with dryers (64 percent) was greater than that of western North Dakota (42 percent). The 41 managers with dryers dried their wheat down to an average of 13 percent moisture; the elevators could dry an average of 1006 bushels of wheat per hour from 18 percent moisture down to 12.5 percent. The managers without dryers indicated that they did not take much wheat over 13.5 percent moisture. The average cost of drying wheat from 18 percent moisture to 12.5 percent moisture was 13.0 cents per bushel (see Figure 19 for frequency distribution). Elevators with over 300,000 bushels of storage capacity had an average drying cost of 11.7 cents per bushel while elevators with less than 300,000 bushels storage capacity averaged 13.8 cents per bushel.

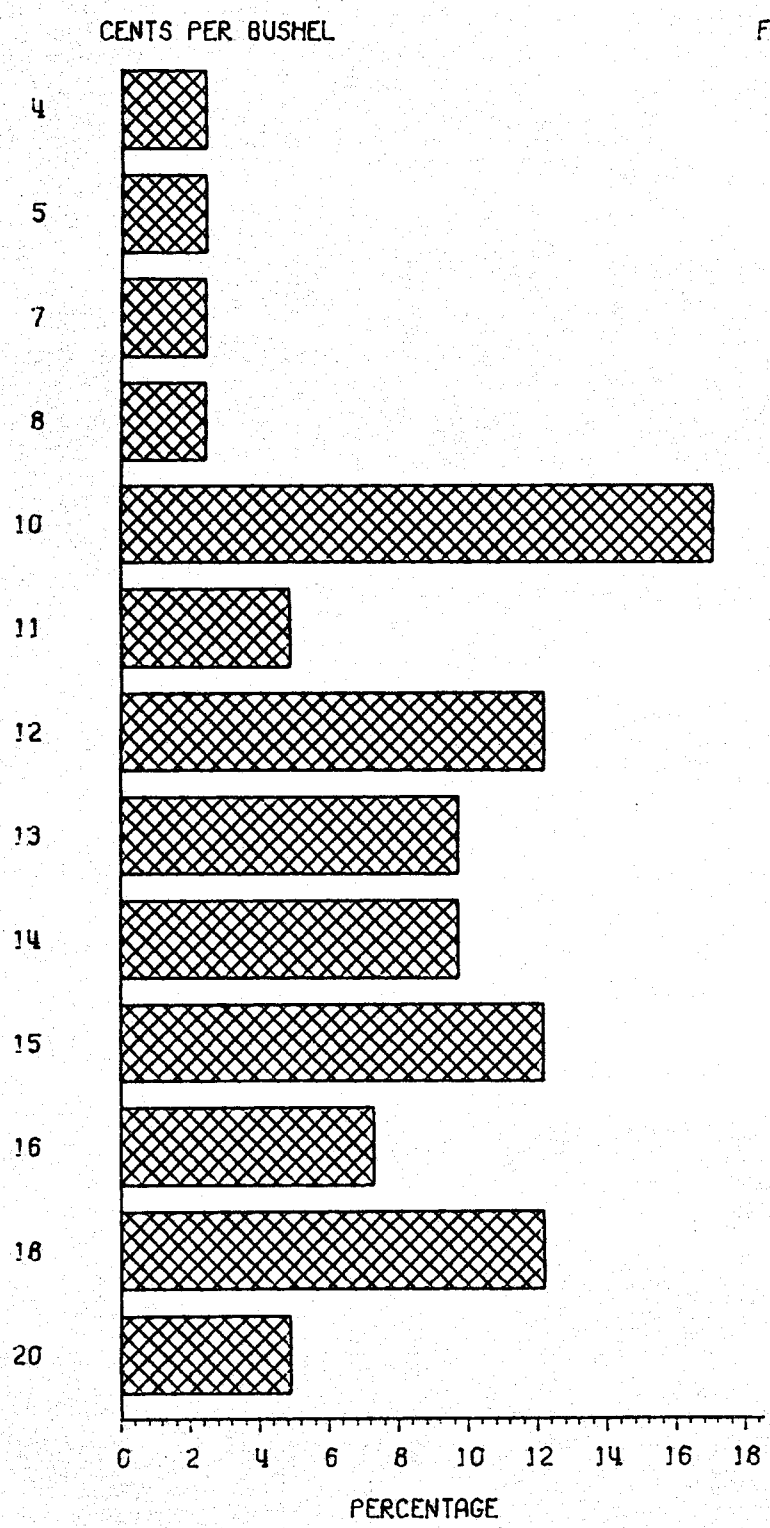
Cleaning Wheat

Cleaning wheat is the process of mechanically separating wheat from dockage. All 77 of the managers responded that they cleaned wheat but not all of the managers used the same type of cleaner. Among the types of cleaners used were Carter (40), Superior (27), Ideal (19), Crippen (5), Clipper (5), Clay (2), Rotex (1), and Texas Shaker (1); some elevators had more than one cleaner.

The managers were asked general questions about their cleaning practices. They commented on what level they called the incoming wheat clean enough not to clean. The average was at 2 percent dockage; some elevators cleaned everything and one elevator only cleaned above 4 percent dockage wheat. On the average managers cleaned the wheat to 1 percent dockage. Some managers cleaned their wheat down to 0 percent while other managers only cleaned down to 3 percent dockage. The 77 elevators had an average cleaning capacity of 1622 bushels per hour. The smallest cleaning capacity was 200 bushels per hour, and the largest was 10,000 bushels per hour.

When asked about the costs of cleaning grain, managers on the average responded that it cost 3.5 cents per bushel (see Figure 20 for frequency distribution). The average price received for wheat screenings was $42.67 per ton. The lowest price received was $25 per ton, and the highest was $55 per ton (see Figure 21 for frequency distribution). Screenings buyers included local farmers, Harvest States feed mills, and other local feed dealers. Screening prices did not significantly vary with location in the state, storage capacity, organizational structure, loadout capacity, distance to competition, or board price.

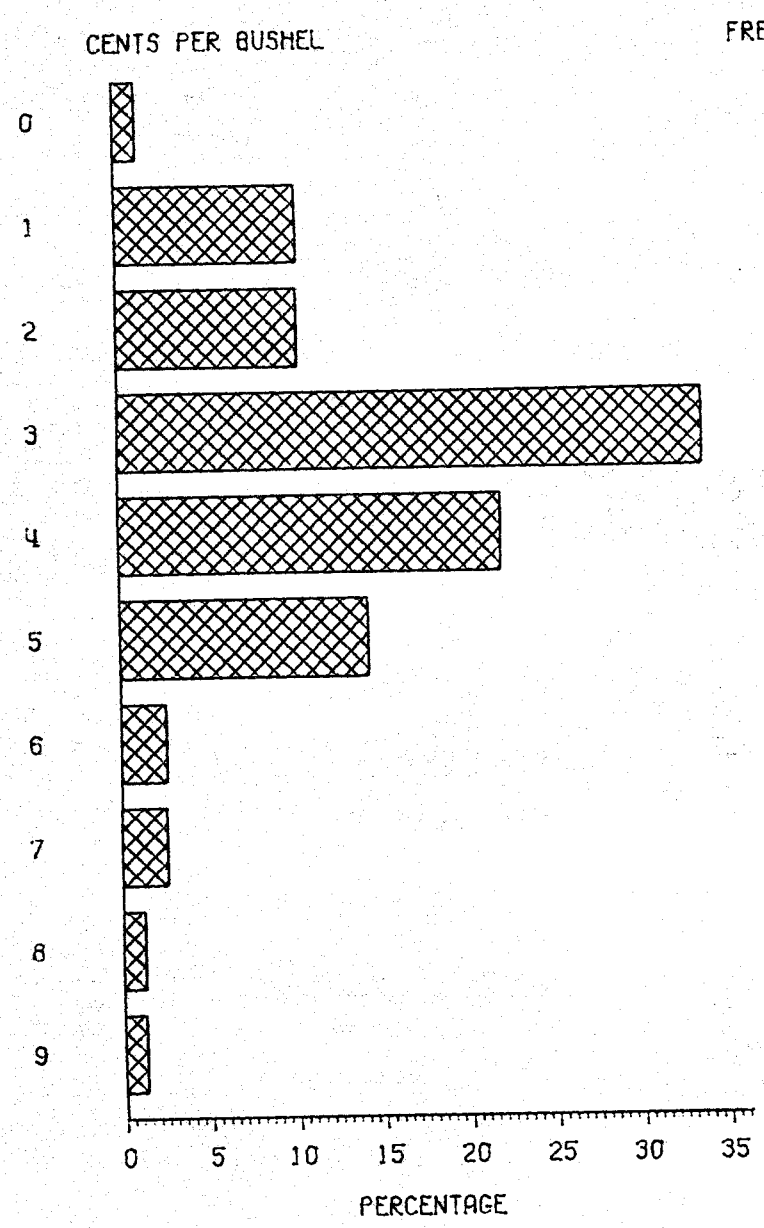
The elevators clean wheat to sell the screenings and to avoid paying transportation on dockage. The net profit from cleaning wheat can be calculated using the equation:



CENTS PER BUSHEL	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
4	1	1	2.44	2.44
5	1	2	2.44	4.88
7	1	3	2.44	7.32
8	1	4	2.44	9.76
10	7	11	17.07	26.83
11	2	13	4.88	31.71
12	5	18	12.20	43.90
13	4	22	9.76	53.66
14	4	26	9.76	63.41
15	5	31	12.20	75.61
16	3	34	7.32	82.93
18	5	39	12.20	95.12
20	2	41	4.88	100.00

Figure 19. Frequency of Estimated Drying Costs Among Selected Country Elevators in North Dakota (December 1984)

SOURCE: Question II. B.6.

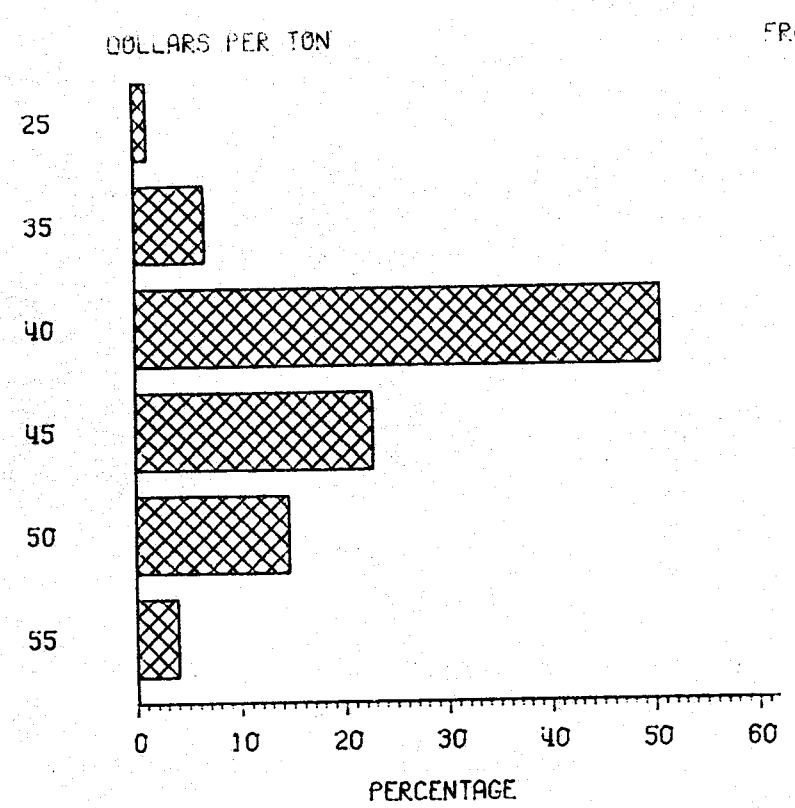


CENTS PER BUSHEL	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
0	1	1	1.30	1.30
1	8	9	10.39	11.69
2	8	17	10.39	22.08
3	26	43	33.77	55.84
4	17	60	22.08	77.92
5	11	71	14.29	92.21
6	2	73	2.60	94.81
7	2	75	2.60	97.40
8	1	76	1.30	98.70
9	1	77	1.30	100.00

Figure 20. Frequency of Estimated Cleaning Costs Among Selected Country Elevators in North Dakota (December 1984)

SOURCE: Question II. A.5.

(W)(D)(S + T) - (CW) = net profit,
where W = the amount of wheat in lbs.,
D = the percentage of dockage in the wheat,
S = the price received for wheat screenings per lb.,
T = the cost of transportation from the elevator to the destination market, and
C = the cost of cleaning wheat per lb.,



DOLLARS PER TON	FREQ	CUM FREQ	PERCENT	CUM PERCENT
25	1	1	1.33	1.33
35	5	6	6.67	8.00
40	38	44	50.67	58.67
45	17	61	22.67	81.33
50	11	72	14.67	96.00
55	3	75	4.00	100.00

Figure 21. Frequency of Estimated Wheat Screenings Values Among Selected Country Elevators in North Dakota (December 1984)

SOURCE: Question II. B.8.

Table 12 contains results from calculating the net profit from cleaning given changes in percentage of dockage, cost of cleaning, and price of screenings. The economics of cleaning depend on the dockage level, price of screenings, transportation costs, and the cost of cleaning. When average values for each factor were used, it appeared economical for an elevator to clean down to 2 percent dockage and uneconomical for an elevator to clean down to 1 percent dockage with the given costs and prices in 1984.

Binning and Blending

Binning and blending practices also varied among the elevators. The average number of bins available for segregation of wheat was 18.0, with a high of 57 bins and a low of 4 bins. The average number of bins used for blending wheat when shipping was 5.4 bins; the highest was 30 bins and the low was two bins. Each elevator manager was asked if he ever bought or sold wheat to other elevators for blending. Fourteen elevator managers bought wheat from other elevators for blending, and thirteen managers sold wheat to other elevators for blending.

Each elevator manager rated specific factors on how constraining the factors were as far as blending grain while loading out. The factors were too few bins, too few bins in the mainhouse, inability to make accurate grade

TABLE 12. ECONOMICS OF CLEANING WHEAT WITH VARIOUS SPECIFIED CLEANING COSTS, SCREENING PRICES, AND DOCKAGE PERCENTAGES

	Net Savings on a 50,000 lb. Transaction for Cleaning					
	4.0¢/Bushel Cleaning Cost		3.5¢/Bushel Cleaning Cost		3.0¢/Bushel Cleaning Cost	
Dockage Percent	Screening $45/ton	Screening $40/ton	Screening $45/ton	Screening $40/ton	Screening $45/ton	Screening $40/ton
5	$47.92	$41.67	$52.08	$45.83	$56.25	$50.00
4	31.67	26.67	35.83	30.83	40.00	35.00
3	15.42	11.67	19.58	15.83	23.75	20.00
2	- .83	- 3.33	3.33	.83	8.75	5.00
1	17.08	-18.33	12.92	-14.17	-8.75	-10.00

Notes: transportation cost = 1¢/lb.
net profit from cleaning = (W) (D) (S + T) - (W)(C)
where: W = total weight of unclean grain in lbs.
D = percent dockage in wheat
S = price of wheat screening per lb.
T = cost of transportation per lb.
C = cost of cleaning per lb.

checks while loading out, and capacity of the elevator. The most constraining factor among the elevators was too few bins in the mainhouse, followed by inability to make accurate grade checks, third was too few bins, and the least constraining factor was capacity of the elevator.

Grading and Pricing Wheat When Selling

Buying practices of country elevators are influenced by their selling practices. Selling practices include how the wheat is graded and priced when the elevator is selling.

Most of the grain sold by country elevators is graded and sampled by a federally licensed inspection service at the destination market. Federally licensed inspection services in North Dakota sampled and graded for 13 elevators on single-car shipments, 14 elevators on multiple-car shipments, and 7 elevators on truck shipments. Federally licensed inspection services at the destination market sampled and graded for 64 elevators on single-car shipments, 63 elevators on multiple-car shipments, and 70 elevators on truck shipments. Because the grain is graded by federally licensed inspection services, it is graded according to official guidelines.

The managers indicated that they adjusted prices to the producer just as their buyers adjusted prices to them. For durum, 72 of the managers stated

that the pricing of grade and nongrade factors was the same when they bought grain as when they sold grain. Two managers said that they gave fewer discounts for color and test weight than they received. Seventy-five managers indicated that the pricing of grade and nongrade factors was the same when they bought HRS wheat as when they sold HRS wheat. Two managers said that they gave more favorable price adjustments on protein, damaged kernels, foreign material, contrasting classes, and test weight than they received when selling. Since the managers generally used the same price adjustments as they received and their adjustments were market determined, the adjustments received by the elevators when selling were generally market determined.

Pricing of grade and nongrade factors varied slightly between selling to arrive versus spot market. To-arrive contracts are transactions providing for subsequent delivery within a stipulated time limit of a specific grade of wheat. Spot market is a market of immediate delivery of the wheat for immediate payment. A sample of the wheat is available for the buyer's inspection in the spot market but not in the to-arrive markets (Powers). The elevator managers commented on the percentage of durum and HRS wheat they sold to arrive and spot. For durum, the elevators sold an average of 50 percent to arrive and 50 percent spot. For HRS wheat, the elevators sold an average of 65 percent to arrive and 35 percent spot. The factor and number of managers indicating more favorable price adjustments on the durum spot market were test weight (15), moisture (1), color (22), damage (6), shrunken and broken kernels (2), contrasting classes (4), and variety (4). The factor and number of managers indicating more favorable price adjustments on the HRS wheat spot market were test weight (31), moisture (2), damage (2), foreign material (1), shrunken and broken kernels (1), contrasting classes (1), protein (36).

Pricing of durum and HRS wheat did not differ much between east and west destination markets except for protein levels in HRS wheat. An average of 99 percent of the durum shipped by the responding elevators was shipped to eastern destination markets while 1 percent of the durum was shipped to western destination markets. An average of 82 percent of the HRS wheat was shipped to eastern destination markets while 18 percent of the HRS wheat was shipped to western destination markets. Only two managers saw any difference in price adjustments for durum between western and eastern destination markets; they indicated that color discounts were higher in western markets. Three managers indicated more favorable price adjustments for HRS wheat in eastern destination markets for test weight and total damage. Twenty-four managers indicated that high protein premiums were higher in the east and low protein discounts were lower in the west. None of the managers saw any differences in price adjustments for durum and HRS wheat due to the mode of transportation.

End-user customers occasionally did give more favorable price adjustments than other customers for durum and HRS wheat. End-user customers were defined as customers who process the wheat, such as a flour mill. Other customers were defined as customers who act as intermediaries between the elevator and an end user. Fifteen of the managers handling durum indicated that they sometimes sold durum directly to end-user customers. These end-user customers accounted for an average of 44 percent of the durum handled by these

elevators. Fifteen of the managers handling HRS wheat indicated that they sometimes sold HRS wheat directly to end-user customers. These end-user customers averaged 22 percent of the HRS wheat from these elevators. When asked if end-user customers occasionally gave more favorable price adjustments for durum, five managers stated that they saw occasional premiums on test weight, four managers saw occasional premiums on color, and two saw occasional premiums on variety. When asked if end-user customers occasionally gave more favorable price adjustments for HRS wheat, eight managers indicated that they saw higher premiums on protein and two managers saw occasional premiums on test weight.

Summary and Conclusion

The general trading practices of grading and pricing of wheat among country elevators was discussed in this study. The grading of the durum and HRS wheat generally tended to follow the methods used by federal grain inspection standards, but for some grade and nongrade factors short cuts or cheaper methods of grading were used to save time and money. The price adjustments given by the elevators tended to be determined in the market. The price adjustments did vary among the elevators, but except for protein price adjustments for HRS wheat, the average price adjustments did not vary significantly due to the location in the state, storage capacity of the elevator, type of organizational structure, loadout capacity of the elevator, distance to competition, or the board price for durum and HRS wheat. For HRS wheat a significant difference in price adjustment for protein was found between elevators in eastern and western North Dakota. The difference in protein price adjustments was primarily due to the local supply of protein.

The practices of country elevators in conditioning grain were also examined. Average drying costs from 18 percent moisture down to 12 percent moisture wheat were found to be 13 cents per bushel, and cleaning costs averaged 3.5 cents per bushel. An examination of the economics of cleaning grain indicated that cleaning down to 2 percent dockage was economical but cleaning down to 1 percent was not. The managers considered a shortage of bins in the mainhouse to be the most restrictive factor in blending while loading out, followed by the inability to make accurate grade checks while loading, too few storage bins, and capacity of the elevator.

The practices of the country elevators when selling grain were examined. The wheat tended to be sampled and graded by federally licensed inspection services. This means that official grading methods were used to determine the quality level of wheat. Price adjustments used by the elevators when selling were determined in the markets just as the price adjustments used by the country elevator when buying were determined. This means that country elevators act as communication links for pricing wheat quality between the destination markets and the producer. Durum and HRS wheat sold by the country elevators on the spot market occasionally received more favorable price adjustments than durum and HRS wheat sold to arrive. Price adjustments varied little between eastern and western destination markets, except 24 managers saw higher premiums for high protein HRS wheat at eastern destination markets and lower discounts for low protein HRS wheat at western destination markets. No difference in price adjustments resulted from mode of transportation. Price adjustments were found to be more favorable among end-user customers than other customers for HRS wheat.

The results of the survey indicate that country elevators act as communication links between the producer and the destination markets. The country elevators communicate market-determined price adjustments for various qualities of durum and HRS wheat.

Appendix A
Survey

ELEVATOR GRADE AND NONGRADE PRICING SURVEY
(HRS WHEAT AND DURUM)

I. Description of Firm

1. Name of Firm _____

2. Location of Firm _____

3. This elevator is a: _____ (1) locally owned cooperative elevator
_____ (2) Harvest States line elevator
_____ (3) locally owned private elevator
_____ (4) line elevator of large private company
_____ (5) other _____

4. Does this elevator have access to rail for shipping grain?
_____yes _____no

5. What are the current exempt truck and rail rate for wheat from your elevator to:

	Truck	Single Car	3-Car
Duluth	_____¢/cwt.	_____¢/cwt.	_____¢/cwt.
Minneapolis	_____¢/cwt.	_____¢/cwt.	_____¢/cwt.
Pacific Northwest	_____¢/cwt.	_____¢/cwt.	_____¢/cwt.

	10-Car	26-Car	52-Car
Duluth	_____¢/cwt.	_____¢/cwt.	_____¢/cwt.
Minneapolis	_____¢/cwt.	_____¢/cwt.	_____¢/cwt.
Pacific Northwest	_____¢/cwt.	_____¢/cwt.	_____¢/cwt.

6. What was the estimated total shipments in 1984 for each commodity listed (in 1,000 bushels)? _____corn
_____HRS wheat
_____durum
_____soybeans
_____flax
_____barley
_____sunflower (cwt.)

7. What is the largest number of rail cars that your elevator can load in one day? _____ (1) less than 3 cars
_____ (2) between 3 and 6 cars
_____ (3) between 7 and 12 cars
_____ (4) between 13 and 26 cars
_____ (5) between 27 and 54 cars
_____ (6) more than 54 cars

8. What is the storage capacity of your elevator main house?_____

9. What is the flat storage capacity of your annex(es)?_____

10. What is the upright storage capacity of your annex(es)?_____

11. How far away is your nearest competition?

_____ (1) less than 1 mile

_____ (2) 1 to 5 miles

_____ (3) 6 to 10 miles

_____ (4) More than 10 miles

12. List the major commission companies or track buyers you sell your HRS wheat and durum through and the percentage of sales in 1984 for each company.

Name	Approximate Percent of Sales	
	Durum	HRS Wheat

II. Conditioning of Grain

A. Drying

1. Do you dry durum and HRS wheat? _____yes _____no

2. To what moisture level do you dry your HRS wheat and durum?_____

3. What kind of dryer do you have?_____

4. How many bushels of HRS wheat or durum can you dry in one hour (assume drying from 18% moisture down to 12.5% moisture)?_____

5. What is the estimated cost of drying one bushel of 18% moisture HRS wheat or durum down to 12.5% moisture?_____

B. Cleaning

1. Are you capable of cleaning durum and HRS wheat for shipping and storing? _____yes _____no

2. How many bushels of HRS wheat or durum can you clean in one hour?____

3. To what dockage percentage do you clean durum and HRS wheat at harvest?_____ rest of the year?_____

4. At what dockage percentage do you not clean durum and HRS wheat at harvest?_____ rest of year?_____

5. What kind of cleaner do you have (brand)?_____

6. What is your estimate of what it costs you to clean HRS wheat or durum per bushel?_____

7. Locations of screenings markets:_____

_____

8. What is the price your receive for wheat screenings in fall of 1984?

_____

9. How do you ship your screenings? _____Truck _____Rail _____Other

C. Binning and Blending

1. How many bins can you use for durum and HRS wheat?_____

2. What is the maximum number of bins that you can blend with when you load out durum or HRS wheat?

3. Do you buy grain from other elevators for blending purposes?

4. Do you sell grain to other elevators for blending purposes?

5. Rate the following factors according to which are the most constraining to least constraining with regard to blending?

_____too few bins

_____too few bins in main house

_____inability of making accurate grade checks when loading out

_____capacity of elevator

_____other

D. Grading Grain

1. List the brand of grading equipment you use to measure the following factors? (1) Moisture_____

(2) Protein_____

(3) Dockage_____

(4) Test Weight_____

2. Does the producer have the option of checking your grade by getting a grade from a federally licensed inspection service? _____yes _____no

3. How often do you use inspection services when buying HRS wheat or durum? Durum_____% HRS Wheat_____%

4. How do you test wheat protein percentage?

_____ (1) at actual moisture

_____ (2) adjust protein percent at 14% moisture

_____ (3) adjust protein percent at 12% moisture

_____ (4) do not test protein

_____ (5) other method

III. Grading and Pricing Practices When Buying

HRS Wheat

1. How do you grade the following factors for HRS wheat?

Factor	Determine Grade by Visual Inspection	Determine Grade by Machine	Send Sample to Federally Licensed Inspection Service for Grade	Other Method	No Grade Determined
1. Test Weight					
2. Moisture					
3. Dockage					
4. Protein					
5. Color					
6. Damaged Kernels					
7. Foreign Material					
8. Shrunken or Broken					
9. Contrasting Classes					
10. Variety					
11. Other					

2. Over the years of your experience as a manager, how often was your purchase bid for HRS wheat influenced by the following factors?

Factor	Always	Sometimes	Never	Minimal Level Acceptance Before Discounts Apply
1. Test Weight				
2. Moisture				
3. Dockage				
4. Protein				
5. Color				
6. Damaged Kernels				
7. Foreign Material				
8. Shrunken or Broken				
9. Contrasting Classes				
10. Variety				
11. Other				

3. When pricing HRS wheat based on grade and nongrade factors, how do you adjust prices for each factor?

Factor	According to a Schedule Determined by the Market	According to a Schedule Determined by Manager or Company	No Adjustment
1. Test Weight			
2. Moisture			
3. Dockage			
4. Protein			
5. Color			
6. Damaged Kernels			
7. Foreign Material			
8. Shrunken or Broken			
9. Contrasting Classes			
10. Variety			
11. Other			

4. What was your schedule for premiums and discounts for HRS wheat on November 30 for each factor?

1) Test Weight_____
2) Moisture_____
3) Dockage_____
4) Protein_____
5) Color_____
6) Damaged Kernels_____
7) Foreign Material_____
8) Shrunken or Broken_____
9) Contrasting Classes_____
10) Variety_____
11) Other_____

5. How does the above schedule differ from your harvest schedule?_____

6. When establishing prices for forward or no-price (or delayed price) established contracts at what time are premiums and discounts determined?

	Forward Contract	No-Price Established Contract
(1) at time of contracting		
(2) when grain is delivered		NA
(3) when grain is priced	NA	

7. What is the current board price for HRS wheat?_____

8. What is the base grade for your board price after HRS wheat?_____

1. How do you grade the following factors for durum?

Factor	Determine Grade by Visual Inspection	Determine Grade by Machine	Send Sample to Federally Licensed Inspection Service for Grade	Other Method	No Grade Determined
1. Test Weight					
2. Moisture					
3. Dockage					
4. Protein					
5. Color					
6. Damaged Kernels					
7. Foreign Material					
8. Shrunken or Broken					
9. Contrasting Classes					
10. Variety					
11. Other					

2. Over the years of your experience as a manager, how often was your purchase bid for durum influenced by the following factors?

Factor	Always	Sometimes	Never	Minimal Level Acceptance Before Discounts Apply
1. Test Weight				
2. Moisture				
3. Dockage				
4. Protein				
5. Color				
6. Damaged Kernels				
7. Foreign Material				
8. Shrunken or Broken				
9. Contrasting Classes				
10. Variety				
11. Other				

3. When pricing durum based on grade and nongrade factors, how do you adjust prices for each factor?

Factor	According to a Schedule Determined by the Market	According to a Schedule Determined by Manager or Company	No Adjustment
1. Test Weight			
2. Moisture			
3. Dockage			
4. Protein			
5. Color			
6. Damaged Kernels			
7. Foreign Material			
8. Shrunken or Broken			
9. Contrasting Classes			
10. Variety			
11. Other			

4. What was your schedule for premiums and discounts for durum on November 30 for each factor?

1) Test Weight_____
2) Moisture_____
3) Dockage_____
4) Protein_____
5) Color_____
6) Damaged Kernels_____
7) Foreign Material_____
8) Shrunken or Broken_____
9) Contrasting Classes_____
10) Variety_____
11) Other_____

5. How does the above premiums and discount schedule differ from your harvest schedule?_____

6. When establishing forward or no-price (or delayed price) established contracts when are the premiums and discounts determined?

	Forward Contract	No-Price Established Contract
(1) time of contracting		
(2) time of delivery		NA
(3) time of pricing	NA	

7. What is the current board price for durum?_____

8. What is the base grade for yor board price for durum?_____

IV. Grading and Pricing Practices When Selling

1. Who grades the HRS wheat or durum when you ship by:

	Single Car	Multiple Car	Truck
(1) Federally Licensed Inspection Service in North Dakota			
(2) Federally Licensed Inspection Service at Destination			
(3) Other			

2. How is the sample taken?
_____probe _____automatic sample mechanism _____other

3. Where is the sample of HRS wheat and durum taken when you ship by:

	Single Car	Multiple Car	Truck
(1) Origin			
(2) Destination			
(3) Other			

4. When selling wheat, how does the pricing of grade and nongrade factors differ from buying?

	Durum	HRS Wheat
(1) No difference		
(2) Some factors differ		

5. If some factors differ in the pricing of grade and nongrade factors between buying and selling, which factors differ?

	HRS Wheat	Durum
1) Test Weight		
2) Moisture		
3) Dockage		
4) Protein		
5) Color		
6) Damaged Kernels		
7) Foreign Material		
8) Shrunken or Broken		
9) Contrasting Classes		
10) Variety		
11) Other		

	Durum	HRS Wheat
6. What percentage do you sell as:	to-arrive _____%	to-arrive _____%
	spot _____%	spot _____%

7. How does the pricing of each factor differ when selling HRS wheat by to-arrive vs. spot?

	To-Arrive	Spot
1) Test Weight		
2) Moisture		
3) Dockage		
4) Protein		
5) Color		
6) Damaged Kernels		
7) Foreign Material		
8) Shrunken or Broken		
9) Contrasting Classes		
10) Variety		
11) Other		

8. How does the pricing of each factor differ when selling durum by to-arrive vs. spot?

	To-Arrive	Spot
1) Test Weight		
2) Moisture		
3) Dockage		
4) Protein		
5) Color		
6) Damaged Kernels		
7) Foreign Material		
8) Shrunken or Broken		
9) Contrasting Classes		
10) Variety		
11) Other		

9. What percentage of durum do you sell to east destinations _____%
west destinations _____%

10. What percentage of HRS wheat do you sell to east destinations _____%
west destinations _____%

11. How does the pricing of durum and HRS wheat differ when shipping east vs. west?

	HRS Wheat	Durum
1) Test Weight		
2) Moisture		
3) Dockage		
4) Protein		
5) Color		
6) Damaged Kernels		
7) Foreign Material		
8) Shrunken or Broken		
9) Contrasting Classes		
10) Variety		
11) Other		

12. How does the pricing of each factor differ when shipping durum by truck vs. single car vs. multiple car?

	Truck	Single-Car	Multiple-Car
1) Test Weight			
2) Moisture			
3) Dockage			
4) Protein			
5) Color			
6) Damaged Kernels			
7) Foreign Material			
8) Shrunken or Broken			
9) Contrasting Classes			
10) Variety			
11) Other			

13. How does the pricing of each factor differ when shipping HRS wheat by truck vs. single car vs. multiple car?

	Truck	Single-Car	Multiple-Car
1) Test Weight			
2) Moisture			
3) Dockage			
4) Protein			
5) Color			
6) Damaged Kernels			
7) Foreign Material			
8) Shrunken or Broken			
9) Contrasting Classes			
10) Variety			
11) Other			

14. Do you have end user customers (example millers) who regularly buy from you because of quality? _____yes _____no

15. List end user customers.

	Approximate % of Total Shipments of Each	
	Durum	HRS Wheat

16. How do the following factors differ when selling to end user customers compared to other sales?

	HRS Wheat	Durum
1) Test Weight		
2) Moisture		
3) Dockage		
4) Protein		
5) Color		
6) Damaged Kernels		
7) Foreign Material		
8) Shrunken or Broken		
9) Contrasting Classes		
10) Variety		
11) Other		

Literature Cited

Cramer, G.L., W.G. Heid, Jr. 1983. Grain Marketing Economics. New York: John Wiley and Sons, Inc.

D'Appolonia, B.L., O.J. Banasik, J.C. Olson, and G. Matthienson. 1984. The Quality of the Regional (Montana, North and South Dakota, Minnesota) 1984 Hard Red Spring Wheat (DNS) Crop. Fargo: North Dakota State University, Department of Cereal Chemistry and Technology.

Dick, J.W., O.J. Banasik, and J. Vailijevic. 1984. The Quality of the Regional (Minnesota, Montana, North and South Dakota) 1984 Durum Wheat Crop. Fargo: North Dakota State University, Department of Cereal Chemistry and Technology.

Hirning, H. 1985. Grain Drying Tables. Fargo: North Dakota State University, Cooperative Extension Service, Department of Agricultural Engineering.

Hyslop, J.D. 1970. Price-Quality Relationship in Spring Wheat. Technical Bulletin. St. Paul: University of Minnesota, Agricultural Experiment Station, St. Paul.

Powers, M.J. 1981. Getting Started in Commodity Futures Trading. Cedar Falls, Iowa: Investor Publications, Inc.

Rhodes, V.J. 1978. The Agricultural Marketing System. Columbus, Ohio: Grid Publishing, Inc.

Russell, D.J. 1978. Grain Marketing and Transportation in Minnesota, The Dakotas, and Montana. Minneapolis, Minnesota: The Minneapolis Grain Exchange.

United States Department of Agriculture. 1984. Official United States Standards for Grain. Washington, D.C.: United States Department of Agriculture, Federal Grain Inspection Service.

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