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Buyer preferences for durum wheat: a stated preference approach

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Abstract

The central issue addressed in this paper is the attributes preferred by a sample of buyers of durum wheat grown in Canada. Primary emphasis is the value placed on certain visual and nonvisual attributes by US buyers of durum wheat. In addition, a source variable in the analysis is used to test preferences of US buyers for US-source compared to Canadian-source durum. The latter is a method to test whether durum millers in the US believe that Canadian durum is a superior product, a view widely-held in the Canadian grain trade.

Results indicate that higher bushel weight has a positive effect on purchase probability, and appears to be more important to buyers' purchasing decision than protein content, amylase content, or the choice between no. 1 and no. 2 grade. US millers in the study are shown either a) to prefer US-grown durum over that from Canada, or b) to dislike the single desk seller arrangements involved in purchasing Canadian durum. It appears that US managers who grow or market durum wheat have a competitive edge over their Canadian competitors when marketing to US-based durum users.

1. Introduction

The sole exporter of wheat grown in the Canadian wheat belt is the Canadian Wheat Board (CWB). The CWB views itself as an exporter of high quality wheat, and its export strategy is focused on maintaining high and consistent quality of the wheat that is sold (Canadian Wheat Board, 1996). Another government agency, the Canadian Grain Commission (CGC), works closely with the CWB to set minimum quality standards for grains. The CGC regulates grain inspection and is the body that issues the so-called *certificate final* to each importer of

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Table 1
Exports of durum wheat from Canada to selected countries, three-year average, long term average, and growth in export share

	Exports 3-year average (1996/7–98/9) 1000 tonnes	Exports 10-year average (1986/7–95/6) 1000 tonnes	Percent change in export market share
Algeria	1550	788	39
Morocco	293	26	698
United States	482	280	22
Italy	306	219	−1
Total above	2632	1313	42
Total exports	3969	2810	

Source: Canada Grains Council. Various years. Statistical Handbook. Winnipeg.

Canadian wheat, a certificate that guarantees weight and grade of the grain. All wheat shipped from the prairie region of Canada can be sold only through the CWB, making the CWB the only significant source of Canadian durum. The CWB argues that this combination of single seller and established quality control provides important advantages to buyers of Canadian wheat (including durum), and that those advantages result in higher prices to farmers who sell their grain through the CWB.

While exports of durum wheat from Canada have recently been in the range of 4 million metric tonnes (mmt), this figure is about one-third higher than the long-term average (Table 1). The largest market for Canadian durum is Algeria, with Morocco the most rapidly expanding market. While sales data by both grade and destination are not published, anecdotal evidence suggests both of these are 'price' markets rather than 'quality' markets, in the sense that they are unprepared to pay premiums for higher qualities. Italy is believed to be the best example in the world of a 'quality' market for durum, defined as a market with exacting specifications and requirement for specific quality attributes (Braga and Raffaelli 1992). Exports to Italy are stable or declining. The second largest export market for Canadian durum wheat is the United States (US), assumed to be a quality market simply on the basis of consumer income. Durum exports from Canada to the US have been increasing, but growth of the export market share to the US has been slower than to either of the north African countries (Table 1). These data raise several issues for durum wheat, especially that from Canada: Are there characteristics of Canadian durum that make it less attractive to purchasers in 'quality' markets; have the benefits, if any, of single desk selling of durum been overestimated; or, is some combination of both issues involved in the slow growth of sales to quality durum markets?

World demand for quality durum is expected to rise (Canadian Wheat Board, 1998), but it does not necessarily follow that Canada's export market share will grow. Several recent studies (Kennett 1997a; Kraft et al. 1996; Braga and Raffaelli 1992) examine changes to Canadian wheat marketing that are suggested by changing consumer preferences. Those changes involve both the quality of the product itself, and possibly also the institutions that market Canadian durum. The Italian market seems to have lost its enthusiasm for durum from Canada. Sales to the US have grown, but more slowly than to emerging markets. The purpose of the study has been to examine the perceived quality of Canadian durum wheat in a quality

Table 2
United States supply and disposition of durum wheat, 1995 to 1998 (million bushels)

Year	1995	1996	1997	1998
	Year ending June			
Incoming stocks	26	25	31	26
Production	102	116	88	138
Imports	19	24	19	31
Imports from Canada*	7	14	16	24
Supply (includes imports)	147	165	148	197
Exports	39	38	57	44
Domestic disappearance	82	96	65	98

Source: United States Department of Agriculture, Agricultural Statistics 2000, NASS, Washington, DC, and http://www.fas.usda.gov/grain/highlights/2000/00%2D01/us%5Fcanada/candata.pdf.

* July–August crop year.

market, with the goals of a) assisting efforts to understand and meet buyer expectations for durum wheat, and b) to try to assess how such buyers react to purchasing from the CWB. The US was selected for the study, partly based on ease of communicating with US buyers, and because the US remains the largest as well as the nearest quality market for Canadian durum wheat.

While durum sales from Canada to the United States have occurred in most years since the early 1980s, those sales take place in competition with durum from other importers as well as from domestic US suppliers of durum wheat (Table 2). US production of durum wheat typically exceeds domestic disappearance, so the US is a significant exporter. In spite of its role as a world exporter of durum wheat, the US imports 20–30% of domestic consumption, with typically 10–20% of disappearance coming from Canada. Some of the US durum imports occur in years when crop quality has fallen, allegedly part of the explanation for higher imports leading to the US-Canada ‘wheat war’ of 1994. However, the regular import of durum while domestic crop is being exported is also attributed to export subsidies such as those embodied in the Export Enhancement Program (Alston et al. 1994). These subsidies appear to have led to expanded US exports, creating a vacuum into which durum from Canada and elsewhere entered the US.

2. Purpose

This study uses a stated preference survey of buyers to examine the specific product attributes preferred by a sample of US millers who purchased Canadian durum wheat. The attributes, also called factors, include: protein and amylase content in the durum wheat, source of the durum (whether produced in Canada or US), grade of the durum (whether graded as No. 1 or No.2 according to the current grading system), bushel weight, and price. The estimated effects of these attributes provide information to help answer such questions as:

1. Are quality characteristics, protein and amylase, important in buyers’ purchasing decisions?

2. Are these quality characteristics in (1) above more important than physical characteristics such as bushel weight?
3. How effective is the current grading system in helping durum wheat buyers to differentiate higher from lower quality product?
4. What values do US buyers place on different durum attributes?
5. Have Canadian marketers succeeded in convincing US buyers that durum wheat from Canada is superior to that from the US?

Understanding buyers' perceptions is a possible basis for evaluating marketing program effectiveness, assessing competitor strengths and weaknesses and planning future marketing strategies. Those values depend, however, on selection of the product attributes to be evaluated in the survey. These are outlined next. The model used, a stated preference model (SPM), is also described. A discussion of the survey results, valuation of durum wheat attributes and conclusions follow the discussion on SPM.

3. Product characteristics and attributes

Almost all durum wheat is used in pasta production. The quality characteristics most likely to be important to a durum buyer need to be identified for the survey and the statistical design. While durum wheat varieties vary in cooking quality, within a particular variety cooking quality improves with increasing protein content (Dexter and Matsuo 1977, Matsuo 1982). Some traditional, high price, high-quality durum pasta producers are reported to use only Canadian durum wheat, because it is known to have high and consistent protein content (Braga and Raffaelli 1992). Therefore, protein is chosen as one element for the analysis. Under the Canadian grading system, the protein content is estimated from nitrogen levels as measured by a Combustion Nitrogen Analysis method (Canadian Grain Commission 1997). The predominant guaranteed level is 13.5% (Wilson 1979). The defined reasonable range for protein in this analysis is between 12% and 14%.

The level of the enzyme alpha amylase in the milled durum wheat is also evaluated. If there is sprouting damage to wheat, alpha amylase content of the sample tends to be high (Matsuo 1982). Thus, a high level of alpha amylase indicates lower quality durum (Canada Grains Council 1985). The alpha amylase content is defined by the Hagberg falling number test. Ground wheat is mixed with water in a test tube immersed in boiling water. After being mixed for 60 seconds, a plunger is allowed to fall a measured distance through the mixture. The falling time plus the mixing time in seconds represents the falling number. The higher the falling number, the lower the amount of alpha amylase in the durum samples (Canada Grains Council 1985). In this study, the defined range for amylase content in the grain samples is between 250 and 425.

An important physical characteristic of durum wheat, bushel weight, is chosen for this study to compare to the effect of the quality characteristics. The preferred bushel weight is over 55 pounds per bushel (Canada Grains Council 1985). The defined reasonable range for bushel weight is between 54 and 61 pounds per bushel.

The current Canadian grading system has a five grade structure for durum wheat, in which

Table 3
Product attributes and levels used in study survey

Product attributes/factors	Level 1	Level 2	Level 3	Level 4
Price (US$/ton)	110	130	150	170
Source	Canada	USA	—	—
Grade	No. 1	No. 2	—	—
Bushel Weight (lb)	54	57	59	61
Protein (%)	12	13	13.5	14
Amylase (seconds)	250	300	350	425

No.1 Grade (1 CWAD) is of higher quality than No.2, both in terms of higher test weight and protein levels (Canada Grains Council 1985). The purpose of using grade of durum wheat as one variable in the analysis is to determine whether there is a relationship between decisions to purchase and higher grades as measured in the present grading system. This variable is discrete and only two levels, grades of No.1 and No.2, are included in the questions describing durum wheat.

The source variable is chosen in this analysis to assess whether buyers prefer durum from Canada to durum acquired from the US. This variable is a discrete variable with only two alternatives, Canada and US. Finally, the last variable included in the analysis is price per ton, which takes a range of US$130 to US$170. These prices were consistent with prevailing market prices at the time of the survey.

In summary, the analysis consists of six product attributes; price, source, grade, bushel weight, protein and amylase content. For each product attribute, there are two or four levels. Each of these attributes and their respective levels are shown in Table 3. These are the attributes and levels used in the SPM. Statistical constraints in SPM limit the number of attributes (factors) and levels that can be included in this type of survey.

4. The stated preference model

The stated preference model (SPM) has become widely used in empirical work, particularly in examining choices of travel, environmental amenities, and recreational facilities (Ben-Akiva and Lerman 1987; Kroes and Sheldon 1988; Hensher et al.1988; McLeod et al. 1993; Adamowicz et al. 1994a, 1994b; Louviere 1994). The use of this method in the agri-food industry has also grown (Unterschultz et al. 1997), as its relatively low cost and ease of dealing with differing attributes has become more apparent. Use of the approach has been reinforced by the perception that the approach has strong predictive ability (Louviere 1994).

Stated preference techniques have been used to assess the potential for new markets, to identify important product attributes, to understand future demands and to give directions to marketing strategies. Unterschultz et al. (1998) use SPM to assess the potential for the Canadian beef industry to penetrate the South Korean market. Dunlevy (1998) uses SPM to compare the attributes of Alberta potatoes to those of other regions in the British Columbia table potato market.

SPM can also be used to assess the potential of marketing a new product, or a new feature of an existing product. Quagrainie et al. (1998) use SPM to analyze the potential consumer acceptance of new storage technologies in fresh meat packaging. Kuperis et al. (1999) apply a SPM survey to analyze the potential consumer acceptance of bovine somatotrophin in Canadian dairy production. Since the product being examined is not yet for sale in the market, the benefit or the utility of the purchase cannot be evaluated by observing whether the purchase is made or not. The researchers develop a profile of descriptions about the new product in terms of product attributes and selected levels for each attribute using an orthogonal main effects statistical design. The respondents are asked to reveal their preferences on a set of "total" profile descriptions.

This SPM technique is applied in this study to assess the importance of the quality characteristics of durum wheat on buyers' purchasing decisions, and to permit a tentative assessment of the effectiveness of marketing Canadian durum wheat to US buyers. The model is also used to value specific attributes of durum, and the assumption is that respondents understand and can value the attributes associated with durum purchase.

5. The analytical framework of SPM

The SPM used in this study is a random utility function defined in terms of product attributes, in which the consumer utility associated with selection of a particular product is a function of the utility associated with particular attributes of the product selected. It employs a model described by Adamowicz et al. (1994a), and is based on standard assumptions concerning the disturbance terms and linearity-in-parameters of the indirect utility function. The model is estimated as a multinomial logit function, and permits calculation of the probability that a respondent will choose a product with a defined set of attributes. Coefficients measure the importance of the attributes to the probability of choosing a particular product, and individual attributes can be valued using results from the model.

6. Study area

Italy and US are major markets for Canadian durum wheat. Italy is the world's largest producer of durum wheat pasta, and would be an ideal area for sampling, in order to provide inferences from the technological frontier about the Canadian grading system and about the quality of Canadian durum. However, the US remains an important market for Canadian durum sales, and is one in which Canadian durum has grown more quickly than into Italy. The US was thus selected as the location for assessing characteristics demanded by a 'quality' importer for durum. A list of US durum mills who have purchased durum from Canada was provided by the CWB, and that list is believed to include all major pasta millers in ten States: Arizona, Louisiana, Massachusetts, Minnesota, Missouri, Montana, North Dakota, Ohio, Oregon and Utah. The survey was conducted in 1994, and contact was made by telephone and fax. Initially, phone calls were made to each milling company to seek consent and obtain the name of a contact person. Each milling company that agreed to do the

Table 4
Estimated coefficients of utility model

Variable	Coefficient	Standard error	t-stat	P[|Z| > z]
Price	−0.034	0.017	−2.033	0.042
Source	−1.104	0.545	−2.026	0.043
Grade	0.766	0.557	1.375	0.169
Bushel Weight	0.421	0.102	4.125	0.000
Protein	0.475	0.371	1.280	0.201
Amylase	0.008	0.004	1.988	0.047
Pseudo R^2		0.36		
The log-likelihood ratio test		51.04		

survey was sent a copy of the questionnaire by fax. In total, eight completed questionnaires were returned out of the list of 14 companies, representing 57% response to the study. Each respondent answered eight questions. The sample size is small, but represents a high proportion of the population of millers who have purchased durum from the CWB. The 14 companies in the sample frame are the population of US millers who were purchasing Canadian durum at the time of the survey.

7. The questionnaire

The questionnaire contains only stated preference questions. Respondents were asked to choose alternatives A, B or C for each of eight sets of hypothetical durum wheat samples. Each set of A, B, and C samples reflected different levels of each of the six attributes considered important, namely price, source, grade, bushel weight, protein content, and amylase count (Table 3). It is assumed that the descriptions of the factors will affect the purchaser's perceptions of the product and ultimately translate into a decision to buy or not to buy the specified products. An example description of the choices is in the Appendix. The description of alternative C is the same for every set of questions. It is specified as durum wheat, of US origin, and grading No.2. It has 12% protein content, 300 s (measured in falling speed) of amylase content, weight is 54 pounds per bushel and price is US$130 per ton. The alternative C is the "base" alternative, which acts as a constant subtracted from the utilities of the other alternatives (Louviere 1988). The description (levels) of choices A and B vary in each question.

8. Results

The stated preference results are shown in Table 4. Small sample sizes can lead to large variances in these models resulting in insignificant coefficient estimates and low model fit. Despite the small sample size (64 responses from eight firms), the log-likelihood ratio statistic of 51.04 (Table 4), which is statistically significant at the 95% level, indicates that the attributes/factors examined in the model are jointly important. The pseudo-R^2 of 0.36

(Table 4) also indicates a reasonable fit for this type of model. These statistics provide some assurance that the results have validity and can provide useful inferences.

The results suggest that buyers prefer No.1 grade durum with higher protein. This is consistent with the quality definition suggested by the Canada Grains Council (1985). However, the asymptotic t-statistics (Table 4) indicate the estimated effects of Protein and Grade are not statistically significant at 95% confidence levels, and are not shown to significantly influence buyers' purchasing decisions.

Table 4 also shows that the estimated coefficients of Price, Source, Bushel Weight and Amylase are statistically significant at the 95% confidence level. The estimated coefficient of Price of −0.0341 implies that an increase in price decreases the probability of that product being chosen. The negative sign of the Source coefficient implies that buyers prefer durum of US origin to that of Canadian origin. The positive coefficient of Bushel Weight indicates a preference for higher bushel weights. The amylase content is measured in terms of the falling speed, in which higher falling speed implies lower amylase content. The small positive estimated coefficient implies that buyers prefer durum with lower amylase content.

The signs of the coefficients, with one exception, fit prior expectations. The model can be used to find the implicit value buyers place on individual durum attributes. They can also be used to estimate probabilities of product choice when durum samples vary in price, bushel weight, and amylase content. The signs involved are consistent with prior expectations, as are the (nonsignificant) signs of coefficients for grade and protein content. The unexpected coefficient is the negative sign for country source, indicating a lower probability for selecting durum from Canadian as compared to US sources. Given 1) recent exports to the US market, 2) a belief that Canadian grain has contributed to improved quality of the grist, and 3) suggestions by the CWB or its supporters that single-desk selling provides premium prices, a positive or nonsignificant coefficient to the Source variable was expected. Nevertheless, the results can be used to determine which product is most likely to be chosen. From the perspective of a Canadian marketer, it is now possible to ask: "how much would prices of the Canadian product have to change to equalize the chance of Canadian durum being chosen?" This price change is an estimate of the dollar value of the importance of durum origin, using model results from Table 4.

9. Simulation results

This model consists of a continuous price change variable that can be used to analyze the value of product origin, protein, amylase, grade and bushel weight. First of all, a product profile is set up as in Table 5. The simulation assumes that there are two main alternatives, A and B. Both of these alternatives have the same attributes except that the durum product in alternative A comes from Canada and the one in alternative B comes from the US. Given the estimated results reported in Table 4, the probability of choosing the Canadian durum (i.e., alternative A) is 20.9% and the probability of choosing the US durum (i.e., alternative B) is 63.1%. It requires a price reduction of 24% ($32.40/ton) of the Canadian durum to equalize the probability of choosing Canadian durum versus US durum of equal quality (Table 5). This price difference can in principle be due a) to quality differences believed to

Table 5
Product attributes, choice probabilities, and price change to equalize choice probabilities for Canada origin durum versus US origin durum

Scenario	Alternative A	Alternative B	Alternative C*
Price	135	135	130
Source	Canada	USA	USA
Grade	No.2	No.2	No. 2
Bushel Weight	55	55	54
Protein	13.50	13.50	12.00
Amylase	350	350	300
Probability of choice	20.9%	63.1%	16.0%
Price change required for indifference	−24.00%	—	—
Probability of choice after price change	44.4%	44.4%	11.2%

* Common alternative used in each scenario, expected to have low probability of choice.

exist between United States durum and Canadian durum but not included in the survey (for example, marketing costs or physical grain attributes), b) to a wish to buy domestic product even at a higher price, or c) to an unwillingness to deal with the monopoly seller of Canadian durum.

The value of the product attributes can also be analyzed by comparing two alternative samples of Canadian durum (Table 6). This simulation assumes that there are two main alternatives, A and B. Both are from Canada, and both have similar attributes except the durum in alternative A has a protein level that is 1% lower than the durum in alternative B. In this case, the probability of choosing alternative A is 29.6%, and the probability of choosing alternative B is 47.7%. It requires a price reduction of 10.3% ($13.90/ton) for alternative A, which has a lower protein level, to equalize the probability of choosing alternative A and B.

When alternative A has the same attributes as B except a higher amylase content (lower falling number of 300 s), the probability of choosing alternative A is 27.3%, and the probability of choosing alternative B is 41.2% (Table 7). In this case, a price reduction of

Table 6
Product attributes, choice probabilities, and price change to equalize choice probabilities for Canada origin durum with one percent difference in protein level

Scenario	Alternative A	Alternative B	Alternative C*
Price	135	135	130
Source	Canada	Canada	USA
Grade	No.2	No.2	No. 2
Bushel Weight	55	55	54
Protein	13.50	14.50	12.00
Amylase	350	350	300
Probability of choice	29.6%	47.7%	22.6%
Price change required for indifference	−10.3%	—	—
Probability of choice after price change	40.4%	40.4%	19.2%

* Common alternative used in each scenario, expected to have low probability of choice.

Table 7
Product attributes, choice probabilities, and price change to equalize choice probabilities for Canada origin durum with 50 second difference in falling number of amylase content

Scenario	Alternative A	Alternative B	Alternative C*
Price	135	135	130
Source	Canada	Canada	USA
Grade	No.2	No.2	No. 2
Bushel Weight	55	55	54
Protein	13.50	13.50	12.00
Amylase	300	350	300
Probability of choice	27.3%	41.2%	31.5%
Price change required for indifference	−8.9%	—	—
Probability of choice after price change	36.2%	36.2%	27.6%

* Common alternative used in each scenario, expected to have low probability of choice.

8.9% ($12.00/ton) for alternative A is required to equalize the probability of choosing alternatives A and B.

When alternative A has the same attributes as B except the bushel weight of Alternative A is 1 pound less than that of alternative B, the probability of choosing alternative A is 27.1%, and the probability of choosing alternative B is 41.3% (Table 8). In this case, price reduction of 9.1% ($12.30/ton) for alternative A is required to equalize the probability of choosing alternative A and B.

These results suggest that significant but relatively modest price reductions are associated with modest changes in the protein, amylase or bushel weight characteristics of the sample. Canadian source appears to lead to significantly lower probability of purchase, however, and a relatively large reduction in price is needed to equalize the probability of purchase of apparently similar durum from Canadian and US sources. Canadian managers who market durum should conclude from this analysis that the US is not a premium market for Canadian durum product relative to comparable US durum.

Table 8
Product attributes, choice probabilities, and price change to equalize choice probabilities for Canada origin durum with one pound difference in Bushel Weight

Scenario	Alternative A	Alternative B	Alternative C*
Price	135	135	130
Source	Canada	Canada	USA
Grade	No.2	No.2	No. 2
Bushel Weight	54	55	54
Protein	13.50	13.50	12.00
Amylase	350	350	300
Probability of choice	27.1%	41.3%	31.6%
Price change required for indifference	−9.1%	—	—
Probability of choice after price change	36.2%	36.2%	27.6%

* Common alternative used in each scenario, expected to have low probability of choice.

10. Summary and inferences

This study uses a stated preference technique to evaluate US millers' preferences for durum wheat, with the goal of providing a preliminary assessment of marketing strategy by the Canadian durum wheat industry. Several studies (Ardeni and Paris 1984; Braga and Raffaelli 1992) suggest that product quality is the key variable for understanding the changes in the durum wheat market. Canada has a reputation as an exporter of high quality wheat, a reputation built on the strategy of maintaining a high and consistent quality by setting the minimum quality standards for the grains and regulating grain inspections. For decades, Canada is believed to have captured the high quality durum market and maintained a leadership position in durum exports. Nevertheless, observing the decrease in Canada's market share in Italy during 1988–1990, Braga and Raffaelli (1992) concluded that the Canadian grading system does not fully meet the sophisticated requirements of an advanced processing industry, and that Canadian durum cannot justify a high price premium. The results of this survey suggest that US buyers also are unprepared to pay premium prices for Canadian durum. A Canadian durum marketing strategy based on extracting a quality price premium from US pasta processors may lead to the erosion of Canadian market share in the US market.

The empirical results from this survey indicate that nutritional value in terms of protein does not have a significant influence on the buyers' decision for durum purchase. Buyers' decisions appear to rely on physical characteristics such as bushel weight. This may in part be due to the fact that protein cannot be identified as readily as bushel weight, and it is possible that buyers assume bushel weight and protein level are correlated. If that is so, there is a potential issue in terms of separating the effects of these variables. However, protein does appear of lower importance than more obvious physical attributes in the purchasing decision.

A major way in which this study differs from typical attribute-pricing studies is that it includes a source location variable, an attempt to assess the preference of US buyers for US versus Canadian durum. Identification issues (Epple 1987) can arise with this approach 1) if location is associated in the minds of buyers with a particular set of attributes, 2) if an important attribute is neglected from the analysis and happens to be correlated with the 'source of product' variable used in the analysis, and more generally 3) if the market is segmented to the degree that buyers have independent and differing sets of product attribute requirements. While the statistical results, and the reasonably narrow definition of users, provide some confidence concerning common attribute requirements, it is clear that concerns 1) and 2) are intertwined to the extent that it is impossible to indicate the precise reasons for the preference of buyers for US-source durum.

Canadian durum does not have a competitive advantage over US durum in the view of survey respondents. On the contrary, study results suggest that Canadian durum, compared to US durum of an equal grade and protein content, requires a significant price discount to appeal to US durum buyers. Possible candidates for understanding the lower probability of purchase of durum from Canada include 1) belief by US buyers that US durum is better suited to current milling practices than is durum from Canada, 2) desire to purchase locally

for noneconomic reasons, or 3) a perception that the CWB is a difficult or inconvenient supplier of durum. Since there seems little evidence that US-made durum products are advertised as 'US-only', the explanation is likely 1) or 3) above. Either explanation is consistent with the observed results, and indeed it is possible that the explanation consists of a mix of both quality perceptions and resistance to dealing with the sole seller. Nevertheless, the results lend little support to the CWB view that it is a preferred source for buyers of durum, nor does it support the view that the CWB is able to extract higher prices because of its reputation for quality and service.

The results of the utility model suggest that the grading system does not provide a powerful guide to potential purchasers. It may be, however, that buyers are using bushel weight as a proxy for grade, and that the interest by buyers in heavier bushel weight reflects a problem with separately identifying the effect of bushel weight versus that of grade. As noted by some recent studies (Hobbs 1996; Hobbs 1997; Hennessy 1996; Kennett 1997a; Kennett 1997b), the failure to convey quality information through transactions in open markets is not uncommon in the food industry, and can be identified as a form of transaction costs.

This study shows that several quality characteristics, previously believed to be important, have a modest role in at least some purchasing decisions. While these results cast doubt on the value added to the durum wheat system by the existence of the grade categories, the results also raise a number of issues for Canadian marketing of durum wheat. Canadian durum has to compete on both price and quality if sales into the US are to be achieved. Similarly, US marketers of durum wheat have an advantage over their Canadian competitors. Meet the US buyer's quality and this US product will be given preference in the purchase decision. Canadian durum does not have a competitive advantage simply because it is sourced from Canada. There may be no benefit in single desk sales of durum wheat from Canada.

There is anecdotal evidence that buyers prefer to purchase product from the CWB, although that view is not supported by the results reported here. Nor do the results presented here suggest, for durum wheat at least, that any desire to buy from the CWB leads to higher prices paid by US buyers. Finally, the results of this study represent views of pasta millers from north, central and south parts of the US. While data availability for this study did not permit regional inferences, a new examination of preferences might well focus on regional differences in attribute preferences among US pasta millers. In particular, it would be especially interesting to know if millers located near the Canadian border have higher or lower preferences for purchase of Canadian durum than those millers located at some distance from the Canadian border.

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