

Canadian Consumers' Willingness to Pay for Pork with Different Attributes

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Abstract— Consumers are interested in credence attributes of meat, including production practices, country of origin and food safety initiatives. Labels and certification assist consumers in identifying credence attributes they desire when making purchase decisions. To maximize returns from meat products, players in the meat supply chain (producers, processors and retailers) need to know the type of products, attributes and information consumers want.

Research to assess consumers' willingness to pay for different pork chops (traditionally raised (TR), TR certified by farm organization, TR certified by government, Canadian Pork and Canadian Quality Assurance® (CQA®), an on farm food safety accreditation label) was undertaken. Willingness to pay is estimated from economic experiments with real pork chops (200 consumers in Edmonton, Alberta, Canada). Initial results suggest significant premiums for traditionally raised production, if certified by government, for the CQA® farm food safety logo and for the Canadian Pork logo. The results suggest that consumers find packaged fresh pork to have higher value when it has more labelling than is routinely provided in grocery stores.

In addition to consumer valuation, hog grade, meat quality and consumer sensory quality of the pork chops used in the experiments was evaluated. Linkages between these quality indicators are examined as are the links between hog quality, meat quality and consumer purchase. The research is relevant to the pork industry in that it identifies the consumer value of individual pork chops, linked to hog, meat and sensory quality, to assist players in the food supply chain in maximizing returns from pork sales.

Keywords— credence attributes, consumers, pork quality.

I. INTRODUCTION

An optimal combination of physical and credence meat attributes can maximize consumer satisfaction and industry returns. Dransfield et al [1] examined European attitudes towards pork from two different

production systems and consumer willingness to pay for pork chops by information (indoor or outdoor production, origin), by appearance, by eating quality and by price. Their results suggested that type of production and origin labels provided a more consistent indicator of consumer purchases than appearance. The aim of this study is to increase understanding of Canadian consumer purchase intentions for pork chops and whether those intentions are consistent with hog, meat and sensory quality, for pork chops with and without labels indicating production system, country of origin and effective on-farm food safety management. Although it is difficult for consumers to predict sensory experience from the fresh pork chops they purchase, whether hog or meat quality indicators can help predict consumer preferences will be directly assessed.

II. MATERIALS AND METHODS

In this research the credence attributes of focus were the type of production (traditionally raised or conventional), country of origin (Canadian Pork, all hogs satisfied) and whether the hogs were produced on a CQA® validated farm (both supplying hog operations satisfied this criteria). Traditionally raised is defined as pork from a family farm production setting, reared outdoors or in bedded settings, with no subtherapeutic antibiotics or growth promotants and no animal by-products in feed. Previous research has shown the importance of certification for credence attributes (Innes and Hobbs [2]) and so, traditionally raised product was identified as either traditionally raised, certified traditionally raised or government certified traditionally raised. Hogs were purchased from two specific hog operations and slaughtered on 5 different dates between November 4, 2009 and December 3, 2009. By sourcing hogs from two operations and by processing all hogs at the same facility, attempts were made to minimize differences

in hog and meat quality associated with geography, management and processing techniques.

The hogs were graded with respect to the processing facility grid. Following slaughter/processing, whole carcasses were chilled overnight. On the next day, both left and right shortloins were removed from each carcass, prepared as boneless, trimmed to the silverskin, wrapped in plastic sheeting, placed in groups of four (two loins from each of two carcasses) into bar-coded and labelled boxes, and moved to short-term frozen storage.

Frozen product was shipped to the Alberta Agriculture and Rural Development Food Processing Development Centre (FPDC; Leduc, AB) where the boxes in each shipment were labelled according to production system (Conventional, Traditionally Raised) and animal number (1-200), and returned to frozen storage (-24°C). Prior to further processing, the loins were organized onto rolling racks. On the morning of further processing, the loin samples were moved to the processing area (7°C). From each pair of loins (i.e. the left/right loins collected from a given carcass), samples were prepared for the three analysis streams: meat quality analyses, economics experimentation, and consumer testing.

For meat quality analyses, a loin section of at least 22 cm (8 inches) was prepared from each animal, vacuum packaged, and placed in frozen storage (analyzed at the University of Alberta). Meat quality analyses are conducted on pH (average), colour (Avg L*, Avg a*, Avg b*), drip loss and cooking loss (percentages) and shear force (average).

One pork loin from each pair was prepared as a series of 2 cm thick pork chops for use in the economics experiment. The pork chops were placed in pairs (superficial surfaces towards the outside) on dri-loc pads in labelled foam trays (approximately 14 x 20 x 2 cm), and overwrapped with gas permeable stretch film. 80 packages were required for each evaluation day.

For consumer testing, two 2 cm thick chops were cut from one loin in each loin pair, labelled, and individually vacuum packaged (Multivac M855 rollstock thermoformer, Woodbridge, ON). These samples were boxed and placed in refrigerated storage, then transported to the Consumer Product Testing

Centre (CPTC: Edmonton, AB) for evaluation two days later.

Consumer panellists were recruited from the panellist database maintained by the Sensory Evaluation Program. To be eligible for participation, the panellists were required to be “users and likers” of pork chops. Each of the 197 panellists (completing) was compensated with a \$60 honorarium.

With a participant target of 200 consumer panellists, the testing of 200 pork chops from each production system, was designed such that each panellist evaluated samples (sample = ½ pork chop) from four different pork loins within each production system treatment. This plan resulted in 8 treatment combinations (2 production systems x 4 replicate loins) assessed by each panellist and four replicate consumer evaluations (panellist blocks) within each pork loin. Treatment presentation order was balanced across panellist blocks according to a Latin square design.

Immediately prior to each evaluation session, individually packaged pork chops (16 per treatment x 2 treatments) were removed from storage, unpackaged, and organized for cooking in two batches. Cooking was conducted by grilling the chops on an electric broiler/grill (Garland ED-42, Russell Food Equipment, Edmonton, AB), preheated to 210°C, while monitoring internal product temperature. The samples were flipped (internal temp. reached 40°C), and removed (final internal temp. of 72°C). Total cook time for any given pork chop was ~20 minutes.

Upon arrival at the CPTC, panellists, seated at individual testing booths, electronically completed the cooked product evaluation questionnaire (v. 5.0, Compusense Inc., Guelph, ON). Samples were presented to the panellists in a sequential monadic manner, on 15 cm white foam plates, labelled with sample-specific three-digit codes. Panellists were asked to judge the appearance, tenderness, juiciness, flavour, and overall acceptability of each sample using 9-point hedonic scales (1=dislike extremely and 9=like extremely). After collection of demographic data, panellists then proceeded to a separate room to complete the economics experiment.

For the economics experiment, all packaged pork chops were labelled with the normal fresh meat

product label containing safe handling instructions, best before date, product price, weight and actual package price. In addition based on a fractional factorial design, products were labelled as traditionally raised (if they were from that operation), as Canadian Pork or as CQA® pork. Products were priced at four

different levels (from \$8.82 per kg to \$15.07 per kg.). Panellists were asked to complete a stated preference exercise, for eight pairs of packaged pork chops (choose A or B or neither).

Consumer testing sessions were organized between November 19, 2009 and December 17, 2009.

III. RESULTS

Data collected on hog, meat and sensory quality are examined to establish if there are statistically significant correlations between any of the technical indicators, by production system. Correlations within any of the three categories are not presented in Tables 1 or 2 (for example there are strong correlations between the six sensory characteristics for both types of hogs). Data across the three categories for the 182 (with complete data) conventional hogs is provided in Table 1, data for traditionally raised hogs is provided in Table 2.

Table1. Correlation Coefficients: Hog, Meat Quality and Sensory Quality Indicators for Conventional Hogs

	HOG		MEAT							
	<i>weight</i>	<i>Index</i>	<i>pH</i>	<i>Avg L*</i>	<i>Avg a*</i>	<i>Avg b*</i>	<i>Drip loss</i>	<i>Cook loss</i>	<i>Shear Force</i>	
MEAT										
	pH									
	Avg L*									
	Avg a*									
	Avg b*									
	Drip loss									
	Cook loss		-0.22							
	Shear Force	0.22								
SENSORY	Outside	0.18			0.20		0.21		0.13	
	Inside	0.14			0.14	0.14	0.19			
	Tenderness			0.14	0.23			-0.22	-0.26	
	Juiciness				0.17			-0.18	-0.16	
	Flavour				0.23	0.15	0.21	-0.15		
	Overall				0.21			-0.17	-0.21	

Table 2: Correlation Coefficients: Hog, Meat Quality and Sensory Quality Indicators for Traditionally Raised Hogs

	HOG		MEAT							
	<i>Weight</i>	<i>Index</i>	<i>pH</i>	<i>Avg L*</i>	<i>Avg a*</i>	<i>Avg b*</i>	<i>Drip loss</i>	<i>Cook loss</i>	<i>Shear Force</i>	
MEAT										
	pH									
	Avg L*	0.21	-0.16							
	Avg a*	0.15								
	Avg b*	0.20								
	Drip loss									
	Cook loss	-0.12								
	Shear Force	-0.19								
SENSORY	Outside			0.13	0.21		0.12		0.15	
	Inside		-0.24	0.16	0.24		0.18		0.12	
	Tenderness		-0.25	0.16	0.19	0.24	0.22			
	Juiciness		-0.24	0.12	0.19	0.21	0.21			
	Flavour	0.16	-0.30	0.14	0.16	0.22	0.24			
	Overall	0.14	-0.31	0.16	0.23	0.23	0.25			

The correlation coefficients suggest that hog weight and index (grade) has little relationship with meat (2/14 indicators) or sensory (2/12) quality for the conventional hogs but stronger relationships (6/12 for meat, 7/12 for sensory) for the traditionally raised hogs. The relationships between meat quality and sensory quality are more numerous (20/42 for conventional and 24/42 for traditionally raised) as expected but again there are more significant relationships for the traditionally raised hogs.

Willingness to pay for pork chops by consumers is assessed using multinomial logit regression. Although there are numerous combinations of technical and labelling attributes to report, only one example is provided here. The probability of selecting a particular pork chop is evaluated for pork chops with the Canadian Pork logo, with the CQA® logo, certified traditionally raised and government certified traditionally raised, conventional pork chops with the Canadian Pork and CQA® logo and for meat colour (L*) (other hog and meat quality combinations remain to be tested). Consumer welfare (willingness to pay) for pork chops with these different attributes is provided in Table 3.

Table 3: Calculated Willingness to Pay for Pork Chops with Different Attributes as compared to a conventional pork chop

Attribute	\$ willing to pay
Canadian Pork	\$1.95
CQA®	\$1.34
Certified Traditionally Raised	\$1.94
Government Certified Traditionally Raised	\$3.89
Conventional with Canadian Pork and CQA®	\$5.70
Meat quality indicator Colour L*	\$-.17

From the above table the value of the information provided to the panellists of some of the information on the credence attributes of the pork chops is not surprising (ranging from 25% to 64% of the current value of pork chops). However the relative size of the economic distaste for pork chops with higher colour L* (paler) is small as compared to the credence attributes. Further research is necessary to

fully test all combinations of credence and physical quality attributes.

IV. CONCLUSION

In this research, hogs from two different production systems were examined on the basis of hog grade, meat quality, sensory quality and in economic experiments with packaged labelled pork chops. The links between hog, meat and sensory quality are stronger for traditionally raised hogs than conventional hogs (although previous research has shown that the traditionally raised were more variable in quality than conventional, Goddard [3]). Initial results suggest that labelled credence attributes are more significant in affecting consumer choice than either hog or meat quality. Further analysis will identify optimal hog/meat quality and labelling combinations. Consumer characteristics that identify those most willing to pay extra for physical and credence attributes will also be identified.

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