Economic Needs Assessment: Pork Quality Grading System

Prepared for the National Pork Board

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Executive Summary

An economic needs assessment for a pork quality grading system in the U.S. was recently completed for the National Pork Board. Information from this study is intended to help guide industry consideration of developing a pork quality grading system. A wealth of information was gathered from published literature, recent pork quality benchmarking assessments, and industry leaders and experts. Combining this industry specific knowledge with broader economic rationale, role, and function of grading systems in agricultural markets led the generation of this report and associated conclusions.

The core finding of this study is that the industry has a pork quality dilemma: an economically relevant portion of product is not meeting retail pork quality targets. However, simply creating a pork quality grading system, given current constraints, is unlikely to fully resolve associated concerns. This conclusion reflects this study noting a) economically significant variability in pork quality present in retail meat counters, b) diverse industry views on pork quality attributes worthy of most attention, c) multiple private initiatives existing involving product quality differentiation, d) currently limited industry understanding of consumer preferences, and e) inadequate ability to accurately measure quality in an acceptable way that is highly associated with end-user value and that could facilitate further exchange of quality and associated pricing information within the industry's supply chain.

Ultimately our main recommendation for strategic planning and broader industry initiatives is to prioritize and focus on efforts that:
1. increase knowledge of current consumer demand and preferences for pork quality;
2. improve the industry's ability to accurately, rapidly, and at low-cost objectively measure quality attributes closely associated with indentified consumer preferences; and
3. expand consumer education on pork quality and associated eating experiences.

If progress on these complex, yet addressable, challenges was made enhancing overall pork quality and increasing consumer pork demand would follow. Advancement on these issues would facilitate pork quality grading being "pulled" into the industry in a manner consistent with end-user value rather than being "pushed" into place – a sure path to failure.

CHAPTER 1: INTRODUCTION, PURPOSE, AND METHODS

Background and Motivation

The U.S. pork industry has a long history of investing to increase production efficiency, enhance pork demand, and generally advance global competitiveness of the pork sector. Similarly, individual firms in the industry routinely assess how their business fits into the broader industry, evaluate how to better align their practices with operational goals, and explore ways to efficiently provide pork desired by consumers. Ultimately, the economic viability of stakeholders spanning the industry's entire supply chain from seedstock producers to retailers hinges on the ability to align desires of current and future potential pork consumers with production, processing, and marketing efforts of the industry. The overall value consumers place on pork directly influences profitability of all firms throughout the industry.

Appreciating this setting for the economic viability of the U.S. pork industry highlights the role of periodically stepping back to assess whether current protocols are providing consumers with a desired set of retail product offerings. If the answer to this broad question is "yes," this suggests production, processing, and marketing activities are generally aligned with consumer demand signals and the market is vertically coordinated. Conversely, if the answer is "no," this suggests at least partial misalignment of efforts and/or price signals in the vertical market system indicating there is a need to improve coordination. This forms the backdrop of this study commissioned to assess economic need for a pork quality grading system in the U.S.

Underlying interest in a potential pork quality grading system is not new to the industry as pork quality concerns have a long history. In discussing the 2002-2003 Benchmarking Value in the Pork Supply Chain project, Meisinger (2003) noted "Industry must develop clear economic signals for easily and objectively measuring "quality," along the production chain, to facilitate coordinated focus on generating pork to meet domestic and global, seasonal and geographical,

consumer demands for fresh, enhanced, processed, consumer-friendly, value-added, and ready-to-eat products."(pg 71).   An older example that depicts how industry practices can change in response to economic signals is offered by noting how lard was once an important product derived from hogs yet over time the industry moved to more lean production with lard losing relevance compared to the pre-World War II era (Martinez and Zering, 2004). This movement was in no small part driven by the "Fat-O-Meter" being developed and the broader industry transition to carcass back fat and lean percentage valuation replacing live hog procurement based mostly on live animal weight.

"Pork quality" is a broad term that can convey diverse things to different parties. The National Pork Board (NPB, 2013) uses this definition: "Pork quality encompasses all meat quality traits affecting processors' and consumers' costs and concerns, including pork color, water-holding capacity (drip loss), intramuscular fat (marbling) and palatability (tenderness, juiciness and flavor)." Similarly, Martinez and Zering (2004) provide a broad definition: "Pork quality is the set of characteristics that make meat desirable. Those characteristics might be determined by: aesthetics (taste, smell, texture, and color); nutrition (vitamins, proteins, minerals, energy, type and proportion of fat); safety (absence of pathogens or toxins); intangible qualities (organic, or meat produced under high standards of animal welfare); and qualities such as convenience and reliability." (pg 6). Throughout our study we also utilize a broad view of pork quality. If future efforts ultimately pursue designing and implementing a pork quality grading system, specific aspects and narrower definitions would be needed, but for now this broad view is both consistent with current industry working definitions and the wide-ranging view appropriate for this needs assessment.

Objective

The main objective of this study was to conduct an economic needs assessment for a pork quality grading system in the U.S. The rationale behind this project is that a need should be determined before additional effort is expended in identifying if a grading system is feasible, designing a system, and assessing potential net economic value.

Procedure

To accomplish the core objective of this project we undertook a series of complementary activities to compile, collect, and add to the body of information regarding the economic need for a quality grading system in the U.S. Our approach can be broadly summarized as sequentially asking and attempting to answer the following questions:

- ➢ *"Is there a concern with pork quality?"*
- ➢ *"If there are concerns, what is the nature of those concerns?"*
- ➢ *"If there are concerns, what can be done?"*
- ➢ *"Given what we found, where do we go from here?"*

The next three chapters of this report are organized sequentially around these questions.

Our assessment included examining existing knowledge regarding pork quality. This included reviewing published journal articles, fact sheets, etc. as well as reviewing findings from the 2012 retail pork quality benchmarking study. The general idea was to synthesize what is known about pork quality without conducting a full meta-analysis as that is beyond the study's scope.

To augment insights offered by written resources, we interviewed industry leaders and experts. We attended the Retail Advisory Committee (RAC) and Packer Processor Industry Council (PPIC) meetings held on April 24, 2013 in New Orleans to launch the project. This provided a key opportunity to capture feedback and broadly announce the project and our interest in follow-up dialogue. Subsequently we conducted phone interviews with representatives of individual

companies to assess both the current pork quality situation and to examine the need for a pork quality grading system. We conducted interviews with numerous leaders from several prominent industry companies including major hog producers, processors, merchandisers, and retailers. This exercise provided a rich set of information from a knowledgeable group that provided essential industry perspectives.

CHAPTER 2: CURRENT SITUATION

The first step in a needs assessment is to examine the current situation. That is, the status quo situation must be documented as a base for comparison in addressing the question of whether a pork quality grading system is needed. The central question of focus was: "is there a concern with pork quality?"

To address this question we gathered a host of information including specific quality estimates from the recent retail pork benchmarking study, an assessment from published journal articles, and insights from industry leaders. We also identified a set of "quality targets" to utilize in comparing current estimates of quality parameters.

Quality Targets

There is surprisingly little published research providing pork quality targets that could be used to benchmark current quality attributes and assess the extent to which quality concerns exist. A frequently noted work is a 2002 fact sheet posted by the NPPC Pork Quality Solutions Team (NPPC, 2002) that provides these targets or ranges:

- Color: 3.0 to 5.0
- pH: 5.6 to 5.9
- Tenderness: <7 lb. (3.2 KG)
- Flavor: robust pork flavor
- Intramuscular Fat "Marbling": 2 to 4%
- Drip Loss: not to exceed 2.5%

In our discussions with industry participants, most sentiments were consistent with these target values. In the absence of an alternative benchmarking resource, we used these values as guidelines to compare current estimates of different quality attributes against.

Benchmarking Study

We interacted iteratively throughout this project with Dr. David Newman who, as leader of the recent retail benchmarking study,was able to provide important estimates of the current status of retail pork quality. Rather than reiterate information available elsewhere, here we include only a couple key demonstrative statistics.

The most recent benchmarking assessment found 55.7% (59.0%) of non-enhanced (enhanced) center-cut loin chops have a marbling score (NPB scale) less than 2.0. Using a target range of 2.0-4.0% this would suggest that over one-half of center-cut loin chops have problematic marbling (product being insufficient in intramuscular fat).

The most recent benchmarking assessment also found 21.7% (18.0%) of non-enhanced (enhanced) center-cut loin chops have a subjective color score (NPB 1-6 scale) less than 3.0. Using a target range of 3.0-5.0 this would suggest that approximately one-in-five center-cut loin chops have a problematic color (product being more pale or lighter in color than desired). In addition to the subjective color assessment, objective (Minolta L*) color score information was available. Based upon Minolta L*, 82.2% (67.9%) of non-enhanced (enhanced) center-cut loin chops have scores exceeding 53.00 (which roughly corresponds with at 3.0 on the subjective scale). The difference in which "a problem exists" based upon the subjective vs. objective color scores is problematic. This disconnect appears to reflect the current inability to assess pork quality more broadly and highlights the need for more research to develop and refine measurement instruments and techniques.

While specific estimates vary depending on the specific quality attribute assessed and the measurement method utilized, overall the 2012 benchmarking study would suggest that a pork quality problem exists. The lower tail of the pork quality being placed on the retail shelf is likely

hurting consumer demand for pork because bad eating experiences lead consumers not to purchase the product.

Published Articles

Overall the published literature we examined is consistent with the "a pork quality problem exists" conclusion offered by the 2012 benchmarking study.

Wright et al. (2005) classified loin chops as "high," "average," or "low" quality. They found 12.5% to 20% of loin chops were "low" quality. Interestingly, the authors found no significant differences in price across quality categories. This finding is consistent with the notion of minimal sorting of products by quality and no revealed demand by consumers for additional "quality enhancement."

One challenge in measuring pork quality is the weak association of quality associated measurements that are currently available with actual pork quality traits. For instance, Boler et al. (2010) provide correlation matrices suggesting that pH assessed 24 hours post mortem has limited ability (+/- 10%) to predict meat color and shear force. Similarly, Huff-Lonergan et al. (2002) provide several estimates of correlations between pork quality traits. While statistically significant correlations were identified, the magnitudes are all less than 0.60 and most are less than 0.25. The inability to measure one pork quality trait and robustly provide knowledge of other quality traits is a challenge that must be appreciated in assessing a pork quality grading system.

Industry Interview Insights

The extent of a current pork quality problem as viewed by industry leaders we interviewed varied. That said, few parties suggested there is no problem and few suggested there is a major problem at hand. Moreover, loin products were generally the items of most discussion and concern was less frequently expressed on hams, butts, and a few other non-loin items. Rather, the general (albeit not fully representative) view is that 10 to 15% of loin products currently being produced are problematic with room for quality improvement. When discussions focused on this 10-15% of product challenges, the influence of existing enhancement, preparation, and related steps used by the industry was highlighted as a point of differing opinions. Narrowly, some industry leaders think current protocol sufficiently addresses the challenge presented by 10-15% of loin products before the product is offered to consumers. Conversely, other industry leaders think a problem persists among the offerings presented to consumers. These views are not cleanly split between processor and retail segments. There are processors who see a significant quality issue as being present, retailers who do not, and vice-versa.

Current Situation Synthesis

Overall, there appears to be general agreement in the published literature, recent benchmarking assessments, and interviews we had with industry leaders that pork quality has room for improvement. More specifically, there is common (albeit not complete) evidence that at least 15% of loin products currently being produced are problematic in terms of overall quality. Using estimates from the recent benchmarking assessment suggests 15% understates the frequency of products failing to meet quality targets. Ultimately, the extent to which estimates of "the problem at hand" are sensitive to the specific attribute examined and measurement approach used is problematic and must be appreciated.

This suggests 20%, or more,eating experiences involving loin products are likely sub-optimal. The frequency of under-performing eating experiences is likely adversely affecting consumers demand. Narrowly, consumers recognize quality inconsistency and reduce demand for inconsistent products. That is, all retail products are transacting through the system but what is "unobserved" is the lower prices that these transactions may be occurring at relative to what could occur in a situation of improved and more certain high quality eating experiences. This possibility of lower pork prices is largely based on research that consumer demand is affected by eating experiences.

A pork quality grading system primarily has value if variation in quality exists. Quality variation provides opportunity to identify and sort product by quality and provide clear transmission of associated pricing signals through the supply chain. Such improved coordination reduces uncertainty in the underlying product quality as the product transgresses through the marketing chain. Furthermore, clear pricing signals associated with pork quality attributes serve as incentives for the industry to improve overall pork quality offered to consumers. Improved quality will likely increase pork demand.

It is important to also recognize is that quality variation is a necessary, but not sufficient, condition for a pork quality grading system to present a valuable opportunity. Similarly, it is important to recognize the consumer demand and knowledge of product quality that underlies the economic relevance of 15% (or more) retail products failing to meet quality targets. We turn to these points in the next chapter.

CHAPTER 3: INDUSTRY OPTIONS TO CONSIDER

The previous chapter provides evidence of variability present in pork quality. With the current situation documented, our assessment turned to the question "what can be done?" Recognizing the general lack of price-quality signal sending vertically in the pork marketing chain, especially domestically, development of a quality grading system appears to offer potential value to address current pork quality variability. However, there are challenges associated with designing a viable quality grading system for pork. Recognizing the opportunity present while being cognizant of the substantial challenges is essential as a standardized quality grading system is being contemplated.

Grading Opportunity

The main purpose of a quality grade is to provide succinct information on attributes of a product that is of economic significance to buyers and sellers. Grading is intended to reduce information asymmetries that exist between sellers and buyers and thereby facilitate more efficient product trade. With a standardized grade in place and assigned to the product, both the buyer and seller can negotiate price knowing the specific attributes of the product for which they are discovering value. Without standardized product quality descriptions in place, buyers are uncertain of the quality of product they are buying and they need to learn from past experience in dealing with specific sellers, go and inspect and sort prior to purchasing, or they face at least occasional dissatisfaction with product quality. All of these represent costs that a standardized quality grade could potentially resolve.

To be economically viable, a quality grade must:

➢ Focus on product attributes that can be measured accurately and objectively at the speed of commerce

➢ Facilitate product sorting by grade

➢ Relate directly to product characteristics valued by potential buyers and/or consumers

➢ Be trusted by potential users

Ideally, a well-functioning quality grade would provide important economic signals to industry encouraging production of higher quality pork products. The result of a well-functioning quality grade would be improved pork quality produced leading to increased demand for pork by domestic and international consumers.

The fact that quality variation exists in pork products that is of economic significance,and little if any price differentiation is present, suggests there may be opportunity to develop a grading system that could signal quality information to buyers and perhaps ultimately to consumers. As noted in the previous section, in our interviews with pork packers and retailers we heard several concerns about pork quality variation that revealed there is justification to further explore potential for a pork grading system. Most often mentioned was specifically the pork loin in this discussion, though at times the ham, butt, and a few other products surfaced in discussion surrounding quality. We often heard that as much as 15% of pork loins had quality concerns associated with them and as noted earlier the recent pork retail study suggests the frequency of concerns might be greater than this.

Having varied quality in and of itself is not necessarily a problem if the products are valued appropriately, sorted, and processed or used in ways that the variation in quality does not provide bad eating experiences for consumers. For example, if product that was likely to result in a dry and tough eating experience was further processed and enhanced so that the actual eating experience was desirable, then quality variation may be less of a concern. In contrast, if product that is likely to result in poor eating experience is on the retail shelf undifferentiated from otherwise excellent quality products, this is bad for the consumer and ultimately the pork

industry. Bad consumer eating experiences result in reduced demand for pork and, as a result, lower pork and hog prices.

Based on what we heard from industry participants, and the information contained in the pork quality audit, poor quality pork products are ending up on the retail shelf undifferentiated from high quality product. This means, pork demand is suffering at least somewhat from varied product quality and eating desirability for consumers. If we stopped here in our assessment, we would conclude that development of a pork quality grading system, especially for loins, appears to be a valuable industry investment that could improve overall pork quality and consumer demand. However, the situation is not that simple so our assessment proceeded further.

Challenges for Pork Grading

Tomek and Robinson (1995) highlight two important decisions that must be made when a grading system is established. The first is selecting the attributes to use as a basis for defining grades. The second is deciding how information on these attributes, once captured by a grading system, should be used and reported. We consider these questions in turn.

What to Measure

If a pork quality grading system were to be developed, the first and foremost question is what to measure to categorize products into different grades?   In our discussions with industry we heard, consistent with the broad working industry definitions noted earlier, several pork quality attributes of interest surface multiple times. The most common specific attributes included (recognizing these may not be mutually exclusive):

1. Color
2. pH
3. Tenderness
4. Marbling
5. Water holding capacity and/or drip loss
6. Product size/weight

Particularly interesting in these quality attributes is that all of them, with the exception of tenderness, are proxies or approximate signals for other product attributes. For example, color is a proxy for eating experience that may include juiciness, flavor, and tenderness; pH is a proxy for water holding capacity and perhaps tenderness, and so forth. If a quality grade were to be developed, given current technology, some combination or subset of these attributes appear to be the probable metrics from which to calibrate a quality grade. That said, the limited extent to which these proxies accurately reflect end-consumer eating experience (as suggested by the current literature noted earlier) must be appreciated.

Another point to note is that some of these quality attributes hold more promise for possible direct communication to consumers (e.g., tenderness) than others (e.g., pH). While this isn't a critical point, it is one worth appreciating given the different current uses pork buyers have for existing attributes. For instance, some buyers are likely more interested in pork color while others may be more interested in tenderness given existing programs their companies have in place or their own views on the extent to which these attributes are accurate proxies of end-user eating experiences. The diverse views of buyers will inherently be reflected in the level of support for any candidate grading system that emphasizes a small set of attributes as no one system will be equally valued by all current pork buyers.

In reality, often times the factors being measured by a quality grade are those that correlate with the specific product attribute being targeted as opposed to directly measuring the attribute of interest which may not be known until the product is actually consumed. As such, the strength of this correlation is critical to quality grading success. For example, if pork color is used as part of a grading system, the color scale must correlate strongly with the eating quality it is serving as a proxy for. If it does not, use of color as a quality metric will have little economic value and a grading system based on color would not be useful for industry or consumers. If there is not a very high correlation between the proxy being measured and the end-user targeted quality attribute, then using that proxy to categorize pork quality is not recommended.

Perhaps even more important, if a product attribute being measured in a quality grading system could be modified to meet the grade standard in a way that was not consistent with the end product eating quality that attribute was serving as a proxy for, then the quality grade could actually result in reduced product quality signaling. For example, if pork color could be modified to match a quality grade specification, but the color modification was not associated with eating quality, even though color was in general otherwise perceived to provide eating quality signals, then the grade would not have integrity. Such ability to modify the product to meet quality grade standards in ways that did not actually improve quality could worsen, rather than improve product quality-value signaling. This extremely important concept, referred to as *adverse selection*, must be kept in mind and minimized if a quality grade system were to be developed.

An additional question we have alluded to already that must be addressed is what products to specifically assign quality grade to if a grade system were developed? Pork loins appear to be the primary target. However, we also heard some concerns about butts, hams, and spare ribs. Because different pork primals go to various end uses and undergo diverse processing and

enhancement post-harvest, distinct product attributes may be more desired for different end-product use.

Even if most could agree on desirability of a particular quality attribute, such as water holding capacity, we know very little about how water holding capacity correlates across different primals originating from the same carcass. This presents a challenge because if a carcass quality grade were established that included water holding capacity as a metric differentiating grades across carcasses, the correlation of water holding capacity across primals for the same carcass becomes very important.   These issues would need further consideration before a grading system was designed at the carcass level.

Alternatively, a grading system enacted at the primal level, for example the loin, must have a way to assign the loin grade back to the individual carcass that it came from. Similarly, if a grading system was placed on specific cuts, for instance center-cut loin chops, trace-back to the original primal, carcass, and producer is needed. If this tracking cannot be done efficiently and accurately, an important disconnect would exist between producer payment schedules and associated product quality attributes assigned to each carcass.

Where to Measure

One of the main benefits of a well-functioning quality grading system, in addition to facilitating exchange, is that over time signals sent by quality grade associated price premiums serve to help improve overall product quality produced in the market. That is, discounts for less desirable product attributes discourage production of those attributes. Likewise, premiums for desired quality characteristics provide incentives to produce products having desired attributes.

In pork, significant quality attribute influencers are present at both hog production as well as in pork slaughter operations. That is, hog production and management, handling, and transportation to market affect quality as do methods used to kill hogs, chilling methods used on carcasses, and post-harvest enhancements. In listing out critical control points for pork quality, Moeller suggests quality variation is influenced roughly equally by on-farm activity and post farm gate activities. The reason this presents challenges in developing a quality grade can be illustrated by example. Consider that a hog could enter the plant with ideal pork product color, but due to improper carcass chilling by the processor, result in product with undesirable color. Where would color be measured to determine quality and how would changes in value associated with changing pork color through chilling be allocated to respective parties? Similar issues are present with pH, tenderness, and perhaps other dimensions of pork product quality.

Need for Accurate, Low Cost, Rapid Quality Assessment

Critical factors that impact feasibility of a quality grade system in pork are the accuracy, cost, and time to assign the grade. Decisions regarding what and where to measure product quality must be driven by how accurate the measurements can be relative to the grade assignment. Furthermore, the cost and time necessary to assign grades would be major determinants of its viability.

The issue of accuracy of quality measurements deserves additional discussion. If the attributes being measured in a grading system are not consistently measured across carcasses, over time, or across plants, this presents a major problem. The costs of dealing with inaccurate or inconsistent measurements in a grading system used to establish pricing schedules can very rapidly swamp any value the grading system might otherwise offer. And of course, accuracy is related to cost and time. Any quality grading system that would adversely affect plant operating efficiency is problematic, unless the value of the grading system is sufficient to offset added costs. In addition to these daily operational cost considerations, the political and

perhaps legal costs associated with debates over differentiated payments likely increase with skepticism of measurement accuracy (i.e., DLR, 2010). This last point was emphasized in our industry discussions as significant measurement accuracy (>95%) was noted as essential for practical and confident utilization.

Currently the industry has a limited set of instruments available to measure quality attributes in an accurate, low cost, and rapid manner. This assertion reflects our industry interviews and is reinforced by existing literature. For instance, while Moeller, Miller, and Zerby (2008) found tenderness and pH of non-enhanced chops to influence consumer perceptions of eating quality, they importantly note the limited practical ability for industry wide assessment. The authors conclude by summarizing this dilemma: "Therefore, while results of the present study provide evidence for the value of shear force and pH as indicators of quality, implementation strategies that improve the logistical challenges present or development of new technologies to meet the challenges are necessary for the industry to make a concerted effort toward improvement of pork eating quality."(pg 3).

Opportunities for Improved Quality without a Grading System

A quality grading system is generally viewed as a formal structured system operated by an independent agent such as the USDA. The unbiased third-party administering the quality grade is essential to ensuring grading integrity. Many examples of federal grade standards presently used in the U.S. for a large number of raw agricultural and food products come to mind as a pork grading system is contemplated. However, formal federal quality grading systems are certainly not the only way to sort products into varied quality categories and price them accordingly. Even where formal long-standing federal quality grades are present, they are often times only part of the quality and pricing differentiation process. For example, federal quality grades for wheat represent only part of the value differentials millers typically pay for wheat as protein, milling, and dough characteristics are also part of the price discovery process.

Whether a formal federal quality grade standard is in place or not, private industry can and does adopt quality differentiation schemes.

The pork sector is a prime example of industry already developing quality signals through private initiatives. For example:

- The hog slaughter industry realized the value associated with CO_2 stunning of hogs relative to its impact on pork color and pH, and despite initial sizeable investment of this technology (we have heard estimates of $6 million per plant), it became the industry standard.

- Pork carcasses are being sorted now for export in some plants based on color and/or pH measures. Such sorting is more consistently providing high quality product for targeted export markets.

- As hog carcasses have become larger, investments have been made by some plants to increase the horsepower of rapid carcass chilling systems to more thoroughly chill larger carcasses to reduce pork coloration problems.

- Some domestic pork buyers are developing more detailed quality specifications that they are requiring of suppliers. Such quality specifications drive private industry investment into quality measurement and differentiation even without a federal quality grade system in place.

- Pork packers and processors have increased production of case-ready branded products in recent years. Competition among packers and processors is intense and packers are striving to differentiate themselves. Further vertical integration into hog production by packers enhances opportunity for quality control at each segment of the industry. Such private industry initiatives essentially substitute for a standardized quality grading system and could in fact make adoption of any such system highly packer-specific.

- The USDA lists a number of Process Verified Programs (USDA PVP, 2013) that various companies are using to substantiate claims including genetics, source verification, antibiotic-free, growth promotant-free, handling, and a host of other production aspects. These are freely initiated efforts to differentiate pork products.

What about the Pork Consumer?

The ultimate beneficiaries of improved and more consistent pork quality are pork consumers. However, to fully benefit from quality improvement, consumers need to be educated about what to look for in pork quality. We heard a very consistent concern from industry participants that current domestic consumers have considerable misconceptions about what visual pork product attributes contribute to desirability of eating experiences. For example, consumers tend to select lighter colored, less marbled pork loin products when they shop. However, the products are actually associated with generally less desirable eating quality. As such, even if a grading system were in place, consumers may not be willing to pay higher prices for what the industry may deem as higher quality in designing the grading system. This is not an insurmountable problem, but it would require investment in educating (some would say re-educating) consumers about pork quality and would slow the sending of value signals higher pork quality would need to encourage improvement in overall quality supplied to consumers.

Several retailers that participated in our surveys indicated that the industry is so focused on price that squeezing price to keep it as low as possible, rather than trying to provide the most consistent and highest quality eating experience for consumers, is driving the pork industry. This indicates that the industry is quite sensitive to pork price and that anything, such as developing and adopting a quality grade that might add cost, is currently viewed with a very skeptical eye. Pork appears to be positioning itself as the other cheap meat to attempt to compete price-wise with chicken as opposed to quality-wise with beef. This is also consistent with multiple studies of meat demand finding pork to have a more elastic (i.e. more sensitive to

own-price) demand than beef and poultry (Tonsor, Mintert, and Schroeder, 2010; Schroeder, Tonsor, and Mintert, 2013).

In *The Power of Meat 2013* study the National Pork Board noted several related points that warrant highlighting. First, emphasis on how retail pork prices increased less than beef prices in 2012 reflects a broader industry approach at positioning pork primarily on a relative price basis. Second, the recent move to new nomenclature on several fresh pork cuts (e.g., pork loin chops being labeled Porterhouse Chops) should be monitored closely. In fact, the *Power of Meat 2013* report suggests the new product labels may lead consumers to improve cooking protocol (reflecting the 145^0 program) and increase knowledge of product color implications (see page 37). Cross-checking what appears to be a focus on providing "cheap pork" with how consumers respond to additional "quality signaling" underlying this relabeling effort will illustrate important points regarding viability of positioning pork more on a quality basis and less on a lowest price basis.

Economic Impact

The exact economic impact of implementing a pork quality grading system is difficult and premature to estimate at this point. Any realized economic impact would be a function of the exact attributes included in a grading system, the available and accepted method for measuring and assigning corresponding quality, the resulting value placed on differentiated grades, the extent to which a grading system is accepted and implemented, and a host of other factors.As documented throughout this report, there is notable uncertainty on each of these points.The purpose this study was to provide a needs assessment and clearly more work is needed before tackling a benefit-cost estimate for the industry.

That said, past work has suggested notable economic importance of pork quality issues, providing context on the value at hand. Two examples are illustrative. Boler et al. (2010) note a 2006 estimate of $90/million per year industry cost to having 15.5% of hogs harvested displaying pale, soft, and exudative (PSE) condition. The industry has responded to the PSE condition because of its economic relevance. Cannon et al. (1996) note an industry survey was conducted as part of the Pork Chain Quality Audit Survey to estimate costs of quality deficiencies. About 10% of live animal value was estimated to be lost (per slaughter hog) due to quality non-conformities. Of this $10.10/head loss, excessive backfat ($2.85) and excessive seamfat ($0.63) combined for largest loss ($3.48). These concerns have largely been responded to by encouraging lean production.

The magnitudes of these economic impact examples underlie the ongoing interest by some industry stakeholders in a pork quality grading system. Potential value in the form of demand enhancement, reducing quality non-conformities, etc. must be weighed against the current feasibility of implementing a viable grading system and in recognition of current private product differentiation initiatives.

CHAPTER 4: RECOMMENDATIONS

The ultimate question we tackled was "given what we found, where do we go from here?"
Here we offer a few key recommendations for the industry to consider:

1. ***Recognize the substantial need and value in ongoing assessment of pork quality and feasible options to improve the situation***. The underlying economic situation driving the quality of pork offerings and the feasibility of adjusting this quality mix change over time, sometimes at a rapid pace. This makes conclusions drawn at any point in time subject to becoming inaccurate and out dated later.

2. ***Collect more information on what domestic pork consumers want and are willing to pay for in pork quality.*** There is lack of consensus on what consumers want and how they might differentially value particular pork product attributes. The current industry strategy is mostly focused on providing cheap pork – reflecting a widely held perception that consumers are focused on price. However, learning more about what drives consumer purchases of pork products relative to <u>price and quality</u> is essential before further consideration of designing any pork quality categorizing, sorting, or enhancement effort.

3. ***Increasing consumer awareness of pork quality and better aligning public perceptions with meat science based quality assessment is critical.*** Probably the clearest disconnect example involves product color where perhaps misinformed consumers select lighter colored pork yet meat science research suggests more dark colored products offer a superior eating experience. This conundrum must be addressed regardless of whether a pork quality grading system is pursued.

4. ***While the industry is in general agreement that quality problem exists there are notably mixed views on how to resolve the issue.*** Recognize multiple mechanisms are available including private initiatives sorting product, engaging in third-party verification systems to substantiate differentiation claims, product enhancement, case-ready branded product, etc.

Moreover, instrumental approaches to accurately measure quality attributes at line speed are currently limited and there are diverse views on exactly which quality attributes are most important to monitor.

5. Sound evidence of consensus market failure remains elusive. There are several cases where alleviating pork quality concerns are addressable by voluntary adjustments that simply are not occurring – presumably because of perceived benefit-cost assessments. For instance, certain export markets have signaled sufficient value triggering additional product sorting and segmentation effort – we failed to obtain evidence of similar signaling by the typical domestic consumer (which reflects recommendation #2). Moreover, more integrated systems that have better information flows already in their business model also have yet to solve this problem. ***Combined, this leads to our ultimate conclusion that addition of a pork grading system on its own would likely be insufficient to resolve the issues of varied pork quality and associated varied consumer eating experiences.***

After conducting this assessment, it is our opinion that simply creating a grading system will not solve the commonly held view of a pork quality problem. If better instruments (e.g.,highly accurate, line speed assessments) and tracking systems (e.g., aligning quality sorting of individual products where quality concerns are highest and more feasible to assess with original carcass and hence producer sources) are designed and become feasible for implementation, many of the desired outcomes underlying support for a grading system would arguably occur on their own. Even if these outcomes failed to naturally develop, the practical viability of more intensely examining a pork quality grading system would improve.

Given the current situation, the collective industry's monetary and political capital may be better utilized at this time with a focus on three substantial tasks: 1) gaining a better understanding of consumer pork quality preferences, 2) developing quality assessing technologies that are viable for commercial implementation and consistent with consumer

preferences, and 3) enhancing consumer education on pork quality and associated eating experiences. These should be top industry priorities for several reasons: 1)they are necessary inputs for any future quality grading system to be viable and provide a net economic benefit for the industry, 2) meeting these challenges offers substantial benefits (and addresses existing industry challenges) to the industry whether a pork quality grading system is ever implemented or not, and 3) profitability in all sectors of pork production, processing, and marketing rests in the hands of consumers.

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