

## A Look at Consumer Willingness to Pay for Pork Products with Environmental Attributes

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#### Summary and Implications

Environmental issues such as air and water quality related to livestock production are receiving much attention. Potential methods for environmental improvement range from regulation to market solutions. This study looks at consumer willingness to pay for pork products with embedded environmental attributes. Experimental auctions showed that over one-half of the participants (62%) paid a premium that did not vary significantly between differing regions of the United States. For the entire group, the average premium paid for the most environmental 2-lb package of pork loin chops was \$.94; a premium of 22%. When evaluated for the premium payers (the 62%), the premium was \$1.60 per package; a premium of 37%.

Results show that participants were willing to pay higher prices for pork products produced in systems with improved environmental attributes. The premium for products with embedded multienvironmental attributes was significantly greater than for those with single environmental attributes. The level of willingness to pay did not vary significantly across regions for the most environmental package. Participants also were willing to pay more for the product with improved surface water, groundwater, and odor emissions than for the product with just two of these attributes. Thus, it appears that the product with the greatest chance of success is one that has all three attributes embedded.

For the most environmental package, bid premiums did not differ significantly between areas studied. Moreover, the percentage of participants paying selected premium levels did not vary between regions. For example, for the triple attribute product, 62% of the participants indicated a willingness to pay a premium. This ranged from 56 to 67% percent across the study area.

This paper shows that there is an opportunity to develop a market for products that embody environmental attributes. Consumers are concerned about the environment

and are willing to pay more for products that are produced in a way that reduces environmental impact. This research suggests that as the industry develops methods that help sustain or improve the environment, there is a segment of society that will support a market for such products.

#### Introduction

Environmental issues related to livestock production have received much attention. These include surface and groundwater quality and livestock odors. A standard way of dealing with nonpoint source pollution from livestock production has been through the encouragement for the use of best management practices (BMP), integrated pest management practices (IPM), or a combination. Although these approaches may improve the environment, economic incentives for farmers to adopt these practices are needed as well.

This article presents results from measuring what pork consumers indicate an improved (sustainable) environment is worth to them. Participants included urban and rural residents from Iowa, Kansas, Vermont, Oregon, and North Carolina. Surveys and experimental auctions were used to obtain participant willingness-to-pay for pork products produced with potential differing environmental improvements or impacts. Specifically, the environmental improvements in this study were related to a reduction in livestock odor, and surface and ground water impacts through swine manure storage and application methods.

#### Materials and Methods

Information on consumer willingness to pay was obtained through the use of an experimental auction. The auction method used was a second-priced sealed-bid auction segmented into five bidding rounds. There have been many studies that have demonstrated the usefulness of experimental auctions for this type of marketing research (2, 3, 4). The auction has the property that it is in the best interest of the participants to reveal their true valuation for the item being auctioned. To familiarize the participants with the second price auction, we first used a preliminary auction to sell candy bars. A multiple trial second price auction with the pork products followed. In the first three rounds of this auction, participants bid only on the physical attributes of the product having no other information except for the previous round's bids. This allowed participants to become familiar with the auction process and obtain feedback on price information. In the fourth round, the participants were informed of the specific environmental

attributes associated with the respective products. In the fifth round, the implications of the environmental attributes were further explained and the participants were allowed to bid a final time.

The products used to elicit bids were 2-lb packages of uniformly cut, boneless, 1¼-inch pork loin chops, which were packaged to look as uniform as possible. The first three rounds of bidding allowed us to identify if the packages provided were perceived as similar. Thus, in round 4, bid responses would reflect the value of the environmental attribute. The participants were allowed simultaneously to bid on 10 different packages of pork chops each having differing environmental attributes. The packages of pork chops were arranged in a row, and placed on ice in one of three white coolers. The 10 packages were labeled 1 through 10. After the third round each participant was told that one package was a “typical package” with no particular environmental attributes. The other nine packages were assigned varying levels of environmental attributes dealing with groundwater, surface water, and odor. Odor reduction was at two levels: a 30–40% reduction, and an 80–90% reduction over the “typical” product. Ground water and surface water impacts were also available at two levels: a 15–25% reduction and a 40–50% reduction over the “typical” product. Packages were provided with single attributes (only air, ground water, or surface water), double attributes, or all three attributes embedded. The double- and triple-attribute pork packages were all at the high reduction levels.

Experiments were conducted in six different areas of the United States: Ames, IA; Iowa Falls, IA; Manhattan, KS; Raleigh, NC; Burlington, VT; and Corvallis, OR. Three experiments were conducted at each site. A random sample of individuals from the area being studied was used to obtain participants for the study. This sample was obtained by a random computer-generated sample drawn from telephone numbers in the respective local telephone directory. Each participant was paid \$40 for participating in the experiment.

### **Results and Discussion**

Of the 333 participants in our study, results from 329 were usable. Premium payers are defined as those who increased their bid from the no information round (round 3) to the information round (round 4) on the most environmental package. Using this definition, we found

that approximately 62% of the 329 participants increased their bid for the most environmental good; that product with all three attributes: air, groundwater, and surface water.

The percentage of participants willing to pay a premium was similar across regions; ranging from 55% at Burlington, VT to 67% at Manhattan, KS.

For the entire group, the average premium paid for the most environmental 2-lb package of pork loin chops was \$0.94, whereas the typical package decreased by \$0.52 (Table 1). The bids exhibited a methodical pattern once the information was released. In the no-information round, the bids appeared to be scattered randomly among the packages. Once the information was released about the environmental attributes, the bids followed the pattern of the more environmental pork packages receiving the higher bids and the less environmental packages receiving the lower bids. Thus, values for the single-attribute packages were slightly higher than the typical package. Participants paid more for the dual-attribute packages than the single-attribute packages, whereas the triple-attribute package commanded the highest premium. When testing the hypothesis of whether premiums differ significantly as environmental attribute levels are increased or combined, we found that at the 5% level each tier of attributes was significantly different from the other tiers. Hence, the package with three high-level attributes was significantly different from the packages with two attributes, as well as, with the packages with just one attribute.

Evaluation of the premium payers shows that the average premium was \$1.60 for the most environmental package; a premium of 37% (Table 3). The premium payers decreased their bid for the typical package when the environmental information was released. Hence, this suggests that there could be a backlash to the typical good once an environmental good hits the market. The premium payers decreased their bid more both in absolute and percentage terms. The premium payers followed the same methodical bidding pattern as the whole group. As shown in Table 3, the single-environmental attribute package ranged from an 8% decline (odor 30–40%) to a 4% increase (surface water 40–50%) following release of information. The double-attribute packages increased from 12 to 16% whereas the bid for the triple-attribute package increased by 37%.

**Table 1. Participant bid levels by environmental attribute information.**

Pork Chop Environmental Attributes (Level of Improvement)	Average Bid Level per Package (\$)		Premium Bid	
	No Information	Environmental Attribute Added	Absolute(\$)*	Percent
No Specific Attributes (Typical)	4.13	3.61	-0.52 <sup>a</sup>	-12.53
Odor 30–40%	4.26	3.87	-0.39 <sup>a</sup>	-9.19
Odor 80–90%	4.05	3.92	-0.13 <sup>b</sup>	-3.23
Groundwater 15–25%	3.91	3.85	-0.06 <sup>b,c</sup>	-1.45
Groundwater 40–50%	4.03	3.94	-0.09 <sup>b,c,d</sup>	-2.12
Surface water 15–25%	4.15	3.99	-0.16 <sup>b,c,d</sup>	-3.94
Surface water 40–50%	4.06	4.10	0.04 <sup>c,d</sup>	0.97
Odor 80–90%/Groundwater 40–50%	4.25	4.56	0.31 <sup>e</sup>	7.41
Odor 80–90%/Surface water 40–50%	4.17	4.58	0.41 <sup>e</sup>	9.88
Odor 80–90%/Groundwater 40–50%/Surface water 40–50%	4.19	5.13	0.94	22.42

\*Corresponding letters indicate that at the 5% level of significance the null hypothesis of the two premiums being equal could not be rejected.

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