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Demand for Pasture-Raised Livestock Products: Results from Michigan Retail Surveys

David S. Conner and Diana Oppenheim

Pasture-raised livestock production offers opportunity for product differentiation and enhanced sustainability. Shopper surveys at three Michigan retail locations measured consumers' attitudes and beliefs regarding pasture-raised livestock products, and willingness to pay for pasture-raised milk and beef. The shoppers associate pasture-raised products with attributes important to purchase decisions. The shoppers express willingness to pay, on average, about 35% more for pasture-raised milk and beef. Informational messages appear to have no effect on these responses. We suggest pasture-raised is a viable marketing strategy and recommend premium pricing strategies and promotion based on verifiable health benefits.

Key Words: animal welfare, consumer demand, pasture-raised livestock products, sustainability, Tobit, willingness to pay

This paper evaluates consumer demand for pasture-raised livestock products. "Pasture raised" (PR) has no standard or universally accepted definition, nor is there a clear demarcation between PR and conventionally or confinement-raised livestock and products. The most important distinctions are: (a) the animals spend their lives outdoors, on pastures (barring birthing, inclement weather, and other limited circumstances), and (b) in the case of ruminants, the animals forage for significant portions, if not all, of their diets. Many pasture-based operations utilize managed intensive rotational grazing (MIRG). One possible definition for PR ruminants would incorporate U.S. Department of Agriculture (USDA) standards for voluntary "grass-fed" claims, requiring all feed after weaning to be solely derived from forage (USDA, 2007). Many pasture-based farmers forego the use of added hormones and sub-therapeutic antibiotics, adhering to more "natural" production methods (Conner, Campbell-Arvai, and Hamm, 2008). One industry group, the

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American Grassfed Association (2007), criticizes the USDA grass-fed standards, in part, for not specifically banning the use of artificial hormones and antibiotics.

This project focuses on beef and dairy products because: (a) Americans consume these products in large amounts; (b) cattle, being ruminants, need no grain or supplemental feed, although many grazing operations do include grain to achieve production goals; (c) Michigan State University (MSU) Extension's Forage Area of Expertise team recommended these as the products with the greatest potential economic impact; and (d) a body of literature supports claims of animal welfare and human health benefits.

Two related motivating factors spark interest in developing the market for these products. They offer an opportunity for niche marketing and product differentiation, and there is evidence that expanding this production system would enhance the sustainability of livestock agriculture. Consumer segments are increasingly buying foods that claim enhanced human health, animal welfare, and ecological impacts. Marketing on the basis of these claims may bring price premiums by filling consumer demand for specific product attributes (Lancaster, 1974; Porter, 1985). This strategy is vital for many small- and medium-scale farms, which are important to rural communities' overall social and economic health (Gomez and Zhang, 2000; Lyson, Torres, and Welsh, 2001; Stofferman, 2006).

Consumer segments are willing to pay a premium for pasture-raised (also called grass-fed) beef. In one study, 23% of consumers preferred grass- over grain-fed beef and were willing to pay on average \$1.36 more per pound (Umberger et al., 2002). Two other studies (Cox et al., 2006; Thilmany, Grannis, and Sparling, 2003) also found consumer segments preferring and willing to pay more for grass-fed or "natural" beef, respectively. "Natural" is defined in the latter study as "raised using sound grazing practices with no antibiotics and never confined to small or crowded pens" (Thilmany, Grannis, and Sparling, p. 152). Another identifies a segment of consumers (13% of sample) who are the most promising targets for "natural" beef products (Ziehl, Thilmany, and Umberger, 2005). McCluskey et al. (2005) find opportunity for producers to market grass-fed beef on the basis of its human health attributes.

We have found no study that measures demand for willingness to pay for PR milk or dairy products where PR is the sole identified attribute. However, demand for pasture-raised dairy products can be somewhat ascertained by the growing sales of organic dairy products, which in a sense are (or at least many believe *should* be) a subset of PR (Weise, 2005). By one estimate, sales of organic milk have grown at an annual rate of 23%, while sales of nonorganic milk have dropped 8% annually (Severson, 2005). One internet-based study found that 42% of those Midwest consumers responding to a (nonrandom) survey are interested in direct delivery of locally produced milk; 10% of respondents are willing to pay a 30% premium for locally produced milk from grazing dairies (Pirog, 2004).

Being able to receive a price premium is important given uncertainty in production and marketing costs of these products. Looking only at on-farm

production costs, the premium may not be necessary. Studies from Wisconsin and New York find lower cost per hundredweight (cwt) of milk for grazing farms (Kriegl, 2005; Knoblauch, Putnam, and Karszes, 2005). One Canadian study (Jannasch et al., n.d.) finds that finishing cattle on pasture (\$0.10/kg) costs less than feedlot finishing (\$0.26/kg). However, another Canadian study warns that cattle produced on forage without the use of growth promotants would need a 16% premium to provide equivalent income to producers (Berthiaume et al., 2006). Furthermore, the marketing costs, risks, and efforts of supplying alternative products outside of existing channels may pose obstacles for many farmers. On the other hand, a stochastic simulation comparing conventional versus intensive pasture-based beef production and marketing reports greater profit and less risk associated with the pasture-based alternative (Evans et al., 2007). While this is an area apparently in need of further research, one can certainly say that premium prices are incentives to adopt alternative methods and, as they persist, allow producers to remain in the market.

A representative statewide poll in Michigan revealed that consumers place great importance on attributes associated with PR. Large majorities (i.e., between 82%–93%) of respondents rated the attributes of humanely raised, environmentally friendly, and produced without supplemental antibiotics or hormones as being very or somewhat important, and approximately 80% agreed with the idea that PR products are healthier for consumers. Difficulties identifying and accessing PR products were commonly mentioned barriers to purchase (Conner, Campbell-Arvai, and Hamm, 2008). The present study attempts in part to identify the degree to which consumers associate “humane” and “environmentally friendly” attributes with PR products.

While many of the nutrition claims about pasture-raised products come from those wishing to market the products to health-conscious consumers, scientific evidence does support certain claims. Clancy (2006) provides an overview of research on human health benefits of consuming pasture-raised beef and milk, and gives examples of health claims she believes would be permissible under current labeling laws. For example, terms like “lean” or “extra-lean” would be permissible, as would claims such as “lower in total fat than conventionally raised cattle.” These claims could be supplemented by wording stating that foods lower in fat may reduce cancer risk. Milk and beef produced on pasture often contain higher levels of various omega-3 fatty acids, which are linked to reduced risk of heart disease. The link of omega-3 fatty acids and heart disease, Clancy adds, would be a qualified claim because no recommended dietary intake currently exists. Auld (2004) concludes that while the literature suggests pasture-raised animals have a better nutrition profile, evidence of direct human health benefits is less clear.

Animal welfare claims can be supported by the literature and may provide another differentiation strategy. Numerous studies report improved health, decreased stress, and other animal welfare benefits associated with raising cattle on pasture rather than in intensive confinement (Goldberg et al., 1992; Krohn and

Munksgaard, 1993; Miller and Wood-Gash, 1991; Washburn et al., 2002; Wells, Garber, and Wagner, 2002; Wilson et al., 2002).

Finally, raising animals on pasture may enhance the environmental, social, and economic sustainability of livestock agriculture. Douglass (1984) posited a seminal definition of sustainable agriculture: “Agriculture will be found to be sustainable when ways are discovered to meet future demands for foodstuffs without imposing on society real increases in social costs of production and without causing the distribution of opportunities or incomes to worsen” (p. 2). The 1990 Farm Bill defines sustainable agriculture as “an integrated system of plant and animal production practices having a site-specific application that will, over the long term:

- satisfy human food and fiber needs;
- enhance environmental quality and the natural resource base upon which the agricultural economy depends;
- make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls;
- sustain the economic viability of farm operations;
- enhance the quality of life for farmers and society as a whole.”

Building on these definitions, many observers use a “three-legged stool” (environment, community, and economy) model to define and discuss issues of sustainability (e.g., Center for Integrated Agricultural Systems, n.d.).

In the context of this three-component model, pasture-based production can enhance agricultural sustainability. A case for improved environmental performance can be made by comparing erosion, phosphorus runoff, and carbon sequestration in pastures versus row crops, which provide the primary feed sources for the confinement model (Bishop et al., 2005; Digiacoia et al., 2001; Guo and Gifford, 2002). Furthermore, a recent study suggests greater energy efficiency in finishing cattle on pasture rather than on grain (Koknaroglu, Ekinici, and Hoffman, 2007).

Pasture-based agriculture has the potential to enhance social sustainability as well, providing an alternative to large confined animal feeding operations (CAFOs)—which have been the focus of many community disputes and have been associated with health problems and decreased property values for residential neighbors (DeLind, 1998; Kilpatrick, 2001; Schiffman, 1998; Wing and Wolf, 2000). In two Wisconsin studies, a higher quality of life was reported among dairy farmers using managed intensive rotational grazing (MIRG) than their peers using conventional methods (Ostrom and Jackson-Smith, 2000; Taylor and Foltz, 2006).

Raising livestock on pasture can also enhance economic sustainability in ways beyond price premiums. For example, grazing dairy operations generally require

less investment, earn greater returns, and achieve higher net income per cow and per cwt (Conner et al., 2006). Reliance on grass-based feed may also help farmers better manage risk in grain supply and potential price volatility as increasing amounts of field crops are used in bio-fuel production.

This article evaluates consumers' awareness, perceptions, and behavior regarding PR products. The research, conducted in Michigan, sought to:

- Measure consumers' awareness of pasture-raised products and the degree to which they associate these products with animal and ecological stewardship and consumer health benefits,
- Compare the effectiveness of different informational messages about pasture-raised products with respect to the likelihood of purchase and consumers' willingness to pay premiums,
- Measure consumers' willingness to pay premiums on pasture-raised products in comparison with conventional animal products, and
- Provide information to producers and vendors that can aid in pricing and promotion decisions.

Methods

The data were collected with a two-page written survey, administered to shoppers at three retail stores in Michigan cities with major universities: an independent grocery store in East Lansing and two co-operative natural foods stores (one in East Lansing, one in Ann Arbor). These stores were chosen because they sell pasture-raised and other alternative livestock products, and were good locations to encounter our target subjects—likely consumers of PR products. The choice of stores ensured that consumers had access to these products.

Using intercept sampling, a researcher set up a table near the store entrance with signs announcing an opportunity to participate in a consumer survey. Those who approached were invited to participate. Per agreement between the researchers and the store managers, consumers were not directly approached or coaxed into participating. Surveys were administered during various times on weekdays and weekend days between October 2006 and January 2007. A total of 253 shoppers completed the survey: 117 from the grocery store, 67 from the East Lansing co-op, and 69 from the Ann Arbor co-op. While no claims of representation of any larger group can be made, the range of locations, days, and times facilitated the gathering of data from a diverse pool of shoppers from these stores.

The survey included a description of the respondents' rights as human subjects under protocols approved by MSU's Institutional Review Board. It provided definitions of "pasture-raised" and "confinement-raised" products. Approximately 25% of survey respondents completed each of four survey versions: (a) with a

message about the efficiency of the confinement system, (b) with a message about the animal welfare benefits of the PR system, (c) with a message about the environmental benefits of the PR system, and (d) with no message (the control). This aspect of the study has similarities to research conducted by Gifford and Bernard (2004), who measured consumer response to differing messages about organic products. Our definitions and messages were developed in consultation with a Michigan State University Professor of Animal Science and are provided in the appendix. The surveys were shuffled prior to reaching the retail locations to randomize the order in which they were given to consumers.

The survey first asked if the respondent had heard of and bought PR products (“yes” or “no” response required for each), and for examples of items purchased. Consumers were then asked to rate their agreement, using a four-point Likert-type scale, with three statements about PR products: “Compared to confinement-raised products, PR products are (a) healthier for people to eat, (b) produced in a more environmentally friendly way, and (c) better for animals’ welfare.”

Respondents were asked to consider choosing between two hypothetical versions of each of two products—beef and milk. Both versions of beef and milk were claimed to be identical in price, size, appearance, quality, and freshness; however, one was labeled “pasture-raised” and the other had no such label. Respondents were asked to rate on a five-point Likert-type scale how likely they would be to buy pasture-raised beef and milk. They were given anchor points of \$3.99 per pound for unlabeled beef and \$2.99 per gallon for unlabeled milk and were then asked the most they would be willing to pay (WTP) for the items labeled “pasture-raised.” These anchors were the actual prices at the grocery store on the first day surveys were administered.¹

Similar to the structural equation model developed by McEachern and Schroder (2004), the survey documented respondents’ demographic characteristics [age, sex, education level, race or ethnicity, marital status, household size (total individuals and those less than 18 years old), employment status, and income], as well as the aforementioned behavioral intentions, past behavior, attitudes, and beliefs. Age, years of education, and household size variables are continuous; income is calculated as the midpoint of a set of categories. Results of the remaining questions led to creation of dummy variables: female (with base case male); white and black (all other responses form base cases); single and married (with base case including divorced, widowed, and other); and working full-time and part-time (with base case including not employed and other).

A number of methods were employed to analyze survey results. Descriptive statistics and/or frequencies illustrate consumers’ past behaviors, awareness, perceptions, and stated preferences regarding PR products, including association

¹ As a methodological issue, as pointed out by a reviewer, it is important to note that the likelihood and WTP portions of the survey ask hypothetical questions about a single purchase, and therefore may be best interpreted as “willing to try and pay once,” rather than “willing to substitute repeatedly in the long run.” These shortcomings admittedly limit the findings’ value to producers when deciding whether to invest in this production technique.

with favorable attributes, likelihood of purchase, and willingness to pay premiums.

The effect of messages was determined by comparing the mean responses of groups exposed to each message. We measure: *the effect of messages* [whether the subject received a survey with the message touting (a) efficiency of confinement, (b) improved animal welfare, (c) environmental benefit, or (d) no message] upon the following seven variables: *belief* that PR products are (1) healthier, (2) more environmentally friendly, and (3) better for animal welfare; *likelihood of purchasing* PR (4) beef and (5) milk; and *willingness to pay* (WTP) for PR (6) beef and (7) milk. The null hypotheses tested were as follows:

$$(1) \quad X_{ia} = X_{ib} = X_{ic} = X_{id},$$

where X_i is the mean value for each variable ($i = 1, \dots, 7$) for each message group: (a) efficiency of confinement, ..., (d) no message.

The one-way ANOVA F -test method is commonly used to compare group means, but ANOVA has an underlying assumption of normality. Two tests of normality, the Kolmogorov-Smirnov and the Shapiro-Wilk, were conducted using the Statistical Package for the Social Sciences (SPSS). In cases of nonnormal distributions, an alternative such as the Kruskal-Wallis test may be used.

Identical tests were used to compare the means of the same seven variables based on the location of the survey site: (a) the grocery store, (b) the co-operative in East Lansing, and (c) the Ann Arbor co-operative. The null hypotheses were:

$$(2) \quad X_{ia} = X_{ib} = X_{ic},$$

where subscripts a , b , and c denote the respective survey locations. In both sets of analyses, the significance measure on the test statistic determines whether the null hypotheses are rejected.

Next, econometric procedures were used to identify demographic, behavioral, and attitudinal factors that influence consumers' stated willingness to pay (WTP). Given that responses at or below the anchor point may imply nonparticipation (refusal to pay any premium or even viewing PR as an inferior good), a Tobit analysis was conducted for each WTP measure, with anchor prices as a lower bound. Another Tobit model was then used to address responses that are in a sense inconsistent—i.e., a consumer stating low likelihood of purchase with high WTP—by creating two dummy variables each for likelihood of buying PR beef and milk. One dummy was coded 1 if the respondent was “somewhat” or “very likely” to purchase, and 0 otherwise (denoted as likely to buy beef and likely to buy milk); the other was coded 1 for “very likely” responses, and 0 for all others (denoted as very likely to buy milk and beef). These dummies were then multiplied by WTP and the computed variables were used in Tobit models, censored at 0.

Finally, to address the possibility of sample selection bias between participants and nonparticipants, a Heckit model (Heckman, 1973; Wooldridge, 2002) was employed. In this case, the demographic and other independent variables were regressed on the decision to participate (measured by the two likelihood dummies from the previous paragraph). The inverse Mill's ratio (λ) was then saved and used as an additional regressor in the WTP equations. A standard *t*-test on λ can test the null hypothesis of no selection bias (Wooldridge, 2002). In all cases, a *t*-test revealed that λ was not statistically different from zero. Hence, we conclude that sample selection bias is not a major issue here, and results of this portion of our analysis are therefore not presented.

Results

Descriptives

Table 1 provides the mean values for the behavioral, attitudinal, and demographic variables. Respondents ranged in age from 19 to 88, with a median age of 44. About half (55%) are female and 75% are white. Median education attainment is a bachelor's degree. Most are either single (i.e., never married) (40%) or married (45%). More than half (62%) reside in one- or two-person households, and 74% have no children in the household under 18.

Overall, these consumers are aware of PR products and associate them with favorable product attributes: 86% had heard of PR products and 79% said they had bought them in the past. More than 60% gave at least one example of items they had bought, with beef, chicken, and eggs the top three responses. Large majorities agreed (somewhat or strongly) with claims that PR products are better for human health, the environment, and animal welfare than confinement-raised products—more than half, two-thirds, and three-fourths strongly agreed, respectively (figure 1).

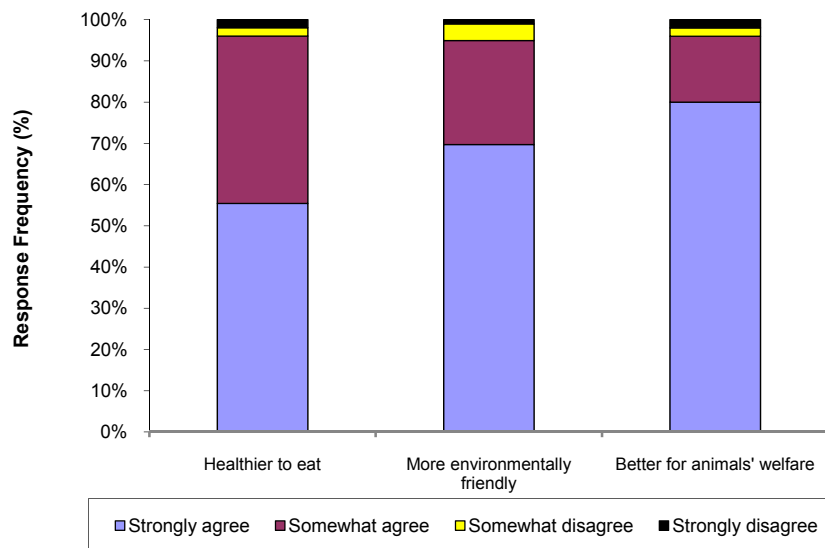
When asked how likely they are to buy PR beef and milk, about 70% indicated very likely for each item, and more than 90% said either very or somewhat likely. Less than 3% answered somewhat or very unlikely to buy either one. When asked how much they would pay, 88% would pay more than the anchor price (\$3.99) for PR beef, and 87% would pay a premium for PR milk. The mean WTP values for beef and milk are \$5.45 and \$4.05 (35% and 37% premiums), respectively. The median figures are \$5.00 (25% premium) for beef and \$3.99 (33% premium) for milk.

Effects of Messages and Locations

Results of both ANOVA *F*-tests and Kruskal-Wallis tests suggest the messages had no significant effect. In the ANOVA analysis, the *F*-statistics were relatively small (ranging from 1.62 to 0.201) and the significance measures were greater than 0.10 for all seven variables. Making specific probability-of-error assumptions

Table 1. Variable Definitions and Descriptive Statistics

Variable Name	Description	Mean
<i>Heard_PB</i>	= 1 if respondent heard of pasture-raised products, = 0 otherwise	0.86
<i>Bought_PB</i>	= 1 if respondent has ever bought pasture-raised products, = 0 otherwise	0.79
<i>Mess_Confine</i>	= 1 if respondent's survey contained pro-confinement message, = 0 otherwise	0.25
<i>Mess_Welfare</i>	= 1 if respondent's survey contained animal welfare benefit message, = 0 otherwise	0.25
<i>Mess_Envir</i>	= 1 if respondent's survey contained environmental benefit message, = 0 otherwise	0.25
<i>Grocery</i>	= 1 if survey took place in mainstream grocery store, = 0 otherwise	0.46
<i>Co-op1</i>	= 1 if survey took place in East Lansing co-op, = 0 otherwise	0.26
<i>Believe_Healthier</i>	Agreement that PR products are healthier for consumer, 4-point Likert-type scale (1 = strongly disagree, 4 = strongly agree)	3.51
<i>Believe_Envir_Fr</i>	Agreement that PR products are more environmentally friendly, 4-point Likert-type scale (1 = strongly disagree, 4 = strongly agree)	3.62
<i>Believe_Welfare</i>	Agreement that PR products are better for animals' welfare, 4-point Likert-type scale (1 = strongly disagree, 4 = strongly agree)	3.73
<i>Age</i>	Respondent's age (years)	44.36
<i>Income_Thou</i>	Respondent's annual gross income (recorded as midpoint of category), in thousand dollars	47.69
<i>Educ</i>	Respondent's years of education	16.51
<i>HH_All</i>	Number of persons in respondent's household	2.69
<i>HH_Under18</i>	Number of persons younger than age 18 in household	0.44
<i>Female</i>	= 1 if female, = 0 otherwise	0.55
<i>White</i>	= 1 if white, = 0 otherwise	0.75
<i>Single</i>	= 1 if respondent is single, = 0 otherwise	0.40
<i>Married</i>	= 1 if respondent is married, = 0 otherwise	0.45
<i>Work_Fulltime</i>	= 1 if respondent works full time, = 0 otherwise	0.55
<i>Work_Parttime</i>	= 1 if respondent works part time, = 0 otherwise	0.26
<i>Likely_Beef</i>	Likelihood of purchasing PR beef, 5-point Likert-type scale (1 = very unlikely, 5 = very likely)	4.58
<i>Likely_Milk</i>	Likelihood of purchasing PR milk, 5-point Likert-type scale (1 = very unlikely, 5 = very likely)	4.58
<i>WTP_Beef</i>	Respondent's willingness to pay for PR beef (\$/pound)	5.45
<i>WTP_Milk</i>	Respondent's willingness to pay for PR milk (\$/gallon)	4.05



Note: Consumers stated their agreement that, compared to confinement-raised products, pasture-raised products are (a) healthier, (b) more environmentally friendly, (c) better for animals' welfare.

Figure 1. Consumer beliefs about pasture-raised products

is inadvisable if normality assumptions are violated, as the ANOVA F -test results are at best asymptotically valid. Nonetheless, the low F -values suggest little influence of messages on the seven variables.

The normality of the variables was tested by both the Kolmogorov-Smirnov and Shapiro-Wilk tests. Under each test, all seven variables violated the normality assumption. Therefore, to test the robustness of results under nonnormal conditions, a Kruskal-Wallis test was used. The test statistic was not significant at the 0.10 level for any of the seven variables—i.e., agreement that PR is better for human health, the environment, and animal welfare; likelihood of purchase or WTP for milk or beef. There was no statistical difference in means among the four treatments. Table 2 shows the means for each variable for each message group. The means appear to be similar for each message group. All tests suggest the same conclusion: Messages did not affect the mean responses associated with the seven variables.

Both ANOVA F -tests and Kruskal-Wallis tests revealed significant differences in shoppers at the different locations. In general, the grocery store (i.e., not co-op) shoppers had lower means for each variable than did either group of co-op shoppers. When means for each location were compared, the Kruskal-Wallis test statistic, for example, revealed a statistically significant difference (at the 0.05 level) for all seven variables.

Table 2. Effects of Messages Viewed by Respondents on Beliefs and Intended Behaviors

Informational Message ^a	Healthier to Eat ^b	Environ. Friendly ^b	Animal Welfare ^b	Likely to Buy Beef ^c	Likely to Buy Milk ^c	WTP Beef (\$/lb.)	WTP Milk (\$/gal.)
— Mean Responses for Each Message Group —							
No Message (control)	3.43	3.68	3.73	4.57	4.48	5.31	4.02
Confinement Efficiency	3.50	3.60	3.80	4.52	4.57	5.42	3.99
Animal Welfare Benefits	3.46	3.55	3.70	4.55	4.56	5.39	4.03
Environmental Benefits	3.65	3.65	3.70	4.68	4.71	5.64	4.14
All	3.51	3.62	3.73	4.58	4.58	5.45	4.05

^a Refer to the appendix for specific content of informational messages.

^b Responses based on four-point Likert scale, where 1 = strongly disagree and 4 = strongly agree.

^c Responses based on five-point Likert scale, where 1 = very unlikely and 5 = very likely.

Econometric Results

As shown in table 3, when the Tobit analysis is applied to WTP for beef, prior purchases, belief in health benefits, and income all have positive effects, as does receiving the environment message. For WTP for milk, prior purchases and number of household members under 18 increase the figure, while the variable *grocery* (a dummy variable for survey location, coded as 1 for shoppers in the grocery store, 0 for shoppers in either co-op) decreases it.

A Tobit analysis was applied to four additional variables (table 4): WTP for those who stated they were (a) somewhat or very likely to buy beef, (b) somewhat or very likely to buy dairy, (c) very likely to buy beef, and (d) very likely to buy dairy. For (somewhat + very) likely beef buyers, prior purchase, environmental message, belief in environmental benefits, and income all have positive signs. For very likely beef buyers, having heard of and bought PR, belief in health benefits, income, and being married all have positive signs, while age, working part-time, and the grocery location have negative signs. For likely milk buyers, prior purchase and number of household members aged 18 or less are positive, while *grocery* is negative. For very likely milk buyers, having heard of and bought PR, belief in health, and being white all have positive signs, and *grocery* again is negative.

Discussion

This study confirms that a large segment of shoppers at the three survey locations are aware of PR livestock products, and express a willingness to purchase these products at a premium. Many of these consumers associate PR products with attributes found in a previous study (Conner, Campbell-Arvai, and Hamm, 2008) to be important to Michigan consumers. Although animals have been raised on

Table 3. Tobit Analyses of WTP, Censored at Anchor Points (\$3.99/lb. for beef, \$2.99/gal. for milk)

Variable	<i>WTP_Beef</i>		<i>WTP_Milk</i>	
	Coefficient	Std. Error	Coefficient	Std. Error
<i>Heard_PB</i>	-0.4507	(0.444)	0.0295	(0.268)
<i>Bought_PB</i>	0.8394**	(0.326)	0.4852**	(0.195)
<i>Mess_Confine</i>	0.4585	(0.379)	-0.1620	(0.218)
<i>Mess_Welfare</i>	0.4059	(0.346)	-0.0272	(0.202)
<i>Mess_Envir</i>	0.6106*	(0.360)	0.0830	(0.205)
<i>Grocery</i>	-0.3456	(0.304)	-0.3611*	(0.184)
<i>Co-op1</i>	0.4369	(0.334)	0.2725	(0.195)
<i>Believe_Healthier</i>	0.4759*	(0.281)	0.2528	(0.165)
<i>Believe_Envir_Fr</i>	0.2454	(0.235)	0.0397	(0.142)
<i>Believe_Welfare</i>	-0.1092	(0.307)	0.1057	(0.183)
<i>Age</i>	-0.0017	(0.010)	0.0075	(0.006)
<i>Income_Thou</i>	0.0183***	(0.007)	0.0010	(0.004)
<i>Educ</i>	-0.0873	(0.066)	-0.0414	(0.038)
<i>HH_All</i>	-0.0329	(0.059)	0.0182	(0.036)
<i>HH_Under18</i>	-0.0689	(0.177)	0.1709*	(0.100)
<i>Female</i>	0.2121	(0.270)	0.1231	(0.159)
<i>White</i>	0.1372	(0.316)	0.1788	(0.191)
<i>Single</i>	0.4132	(0.412)	0.3030	(0.248)
<i>Married</i>	-0.2211	(0.408)	0.1400	(0.243)
<i>Work_Fulltime</i>	0.2198	(0.354)	0.0480	(0.210)
<i>Work_Parttime</i>	-0.2064	(0.412)	0.1794	(0.240)

Note: Single, double, and triple asterisks (*, **, ***) denote statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

pasture for millennia, PR products sold as an alternative to confinement-raised products are relatively new, and therefore likely in the introductory phase of the product life cycle. In this stage, decisions on price and promotion are particularly important (Kotler and Armstrong, 1996) and will influence success in this market.

Implications for Promotion

Currently, PR products are mainly available either directly from farmers or via independent grocers, all likely to have small promotion budgets, and thus heightening the need for effective promotional strategies. None of the messages

Table 4. Tobit Analyses, Censored at Zero (dependent variables calculated as WTP times likelihood-of-purchase dummy variables)

Variable	Likely to Buy Beef Coefficient (Std. Error)	Likely to Buy Milk Coefficient (Std. Error)	Very Likely to Buy Beef Coefficient (Std. Error)	Very Likely to Buy Milk Coefficient (Std. Error)
<i>Heard_PB</i>	0.1304 (0.635)	0.4961 (0.442)	1.7570* (0.998)	1.2980* (0.723)
<i>Bought_PB</i>	1.1710** (0.470)	0.5934* (0.319)	1.3350* (0.713)	0.9501* (0.513)
<i>Mess_Confine</i>	0.2284 (0.542)	-0.2084 (0.362)	0.2365 (0.802)	-0.3503 (0.569)
<i>Mess_Welfare</i>	0.7219 (0.497)	0.1921 (0.335)	0.3643 (0.740)	0.1752 (0.520)
<i>Mess_Envir</i>	0.9762* (0.517)	0.3962 (0.345)	0.1481 (0.772)	-0.1318 (0.527)
<i>Grocery</i>	-0.7074* (0.437)	-0.6986** (0.304)	-1.0700* (0.647)	-1.0640** (0.469)
<i>Co-op1</i>	0.1080 (0.477)	0.1228 (0.322)	0.1875 (0.698)	-0.2103 (0.489)
<i>Believe_Healthier</i>	0.6374 (0.404)	0.3259 (0.277)	1.9800*** (0.616)	1.2960*** (0.433)
<i>Believe_Envir_Fr</i>	0.6760* (0.337)	0.3410 (0.231)	0.6535 (0.528)	0.6081 (0.356)
<i>Believe_Welfare</i>	0.1096 (0.437)	0.2312 (0.298)	0.2671 (0.702)	0.8347 (0.532)
<i>Age</i>	-0.0007 (0.015)	0.0087 (0.010)	-0.0437* (0.023)	-0.0078 (0.016)
<i>Income_Thou</i>	0.0171** (0.0097)	-0.0001 (0.006)	0.0262* (0.014)	-0.0089 (0.010)
<i>Educ</i>	0.0549 (0.096)	0.0653 (0.063)	0.1189 (0.143)	0.0347 (0.098)
<i>HH_All</i>	-0.0049 (0.085)	0.0423 (0.058)	0.0538 (0.123)	-0.0837 (0.115)
<i>HH_Under18</i>	0.0892 (0.255)	0.3066* (0.170)	-0.4808 (0.378)	-0.2465 (0.270)
<i>Female</i>	0.1514 (0.386)	0.0744 (0.263)	0.5554 (0.580)	0.0526 (0.041)
<i>White</i>	0.3682 (0.452)	0.4825 (0.321)	1.0400 (0.675)	1.1160** (0.492)

(continued . . .)

Table 4. Continued

Variable	Likely to Buy Beef Coefficient (Std. Error)	Likely to Buy Milk Coefficient (Std. Error)	Very Likely to Buy Beef Coefficient (Std. Error)	Very Likely to Buy Milk Coefficient (Std. Error)
<i>Single</i>	0.2737 (0.589)	0.4134 (0.402)	-0.8099 (0.875)	0.8409 (0.652)
<i>Married</i>	-0.4934 (0.587)	0.1943 (0.397)	-0.9311 (0.864)	0.9009 (0.639)
<i>Work_Fulltime</i>	-0.2946 (0.502)	-0.2927 (0.342)	-1.0020 (0.741)	-0.1303 (0.531)
<i>Work_Parttime</i>	-0.5636 (0.585)	-0.0661 (0.396)	-1.539* (0.858)	-0.0471 (0.601)

Note: Single, double, and triple asterisks (*, **, ***) denote statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

about PR attributes had a statistically significant impact on these consumers' beliefs, purchase likelihood, or WTP. There are several possible reasons for these findings. The number of respondents may be too low for significant effects to be discernible. Second, many consumers confirmed a good deal of prior awareness of and experience with these products, and consequently may have held strong preconceptions and beliefs which were not influenced by the information in the messages. Also, it is not clear that the respondents carefully read the messages or used the information in their answers. Finally, the messages may have simply been ineffective.

Nevertheless, it is clear that respondents believe PR products are different from and in many ways better than confinement raised, particularly in animal welfare and environmental impacts, but also human health benefits. Belief in health benefits is a statistically significant positive factor in likelihood of purchase and willingness to pay, especially for beef. Therefore, promotion and educational efforts with messages reinforcing PR products' health benefits (such as those suggested by Clancy, 2006) would likely be effective. Conner, Campbell-Arvai, and Hamm (2008) found that pasture-based farmers acquire customers referred by doctors. Enlisting the assistance of health care professionals, especially those practicing alternative medicine, would provide opportunities to target and educate likely buyers, as would networking with environmental activist and mainstream animal welfare groups (e.g., local chapters of the Sierra Club, SPCA, and Humane Society).

Promotional efforts can take a number of forms. A recent study from California (Howard, 2006) suggests most consumers want information on their food from labels, followed by point-of-purchase signage and brochures. Smaller numbers prefer labels with added information at a website. Almost one in five expressed

interest in farm tours to obtain a first-hand view of how food was produced, and a handful preferred talking to the farmer. An array of approaches are needed to address consumers' information needs.

Pricing Implications

It is clear that these shoppers' beliefs in the beneficial and higher qualities of PR products translate into paying a premium. They expressed a willingness to pay on average about 35% more for both beef and milk. While hypothetical responses on a survey may not hold in real-market settings, the consistently high WTP measures suggest farmers and other vendors could likely charge a premium price and be assured of a dedicated group of consumers willing to buy, although it is not certain for what quantity these consumers will pay such premiums.

Other Implications: Place and Policy

The profound effect of survey location holds important information for decision makers. Shoppers at the two co-operative markets were in general much more favorably disposed toward PR products than those in the independent grocery store. While many co-op shoppers may be vegetarian or vegan, and therefore not buyers of certain animal products, those who do consume animal products would appear to be prime consumers who would be loyal and high paying. Offering PR products may also draw new customers and increase consumers' loyalty and confidence in the store, as was found in the early days of the organic market (Morgan and Barbour, 1991).

The distinction between PR and other livestock products may be best articulated by a label and accompanying set of standards, such as the aforementioned USDA (2007) grass-fed standard. A high set of standards would provide a clear distinction for consumers between PR and confinement-raised products. Industry representatives have expressed concern about proposed and enacted USDA grass-fed standards. Proposed standards would have allowed limited feeding of grains; enacted rules were criticized for permitting supplemental hormones, antibiotics, and confinement. These representatives believe that allowing such practices in the production of "grass fed" would mislead consumers (Burros, 2006; American Grassfed Association, 2007).

Information stating the products were raised without added hormones and antibiotics would add value for many consumers, given their high interest in "natural" products (Conner, Campbell-Arvai, and Hamm, 2008); however, it is unclear whether no hormones/antibiotics should be part of PR standards or appear on an additional label and claim. A set of unified standards in combination with a third-party certification system is widely seen as having contributed to the rapid growth of organic foods by increasing consumer confidence and familiarity (Blank and Thompson, 2004).

Conclusions

This study suggests potential demand and growth in the market for pasture-raised (PR) livestock products. However, the findings can be applied with certainty only to the sample—shoppers at three Michigan retail stores known for selling PR and other alternative livestock products. Furthermore, several potential biases are not accounted for, such as predispositions arising from differences in those customers who expressed interest in the survey and those who did not, or who were shopping at the times the survey was administered versus other times. While the sample is fairly diverse in its demographic attributes, and the types of shoppers in the grocery store are certainly different from the co-op shoppers, we cannot generalize these findings to other populations. Social desirability bias is another potential limitation, which some suggest may be mitigated by indirect questions (Alpert, 1971; Fisher, 1993).

Another limitation is the use of stated preference to measure WTP. Researchers have long recognized the limits to indirect measures of willingness to pay, such as contingent valuation questions on written surveys, especially when no budget constraint is imposed nor real tradeoff of money is required (Buzby et al., 1998). Lusk (2003) reports that a “cheap talk” script can reduce WTP responses (and presumably decrease bias) from uninformed consumers, offering a promising approach for future research. The next phase of this study will consist of a series of experimental auctions to compare to the survey measures discussed here.

These findings would be strengthened by measuring WTP on repeat rather than single purchases. An additional question asking, e.g., frequency of purchase of pasture-raised products at the stated price would help, although this would also be a hypothetical nonbinding response. Another needed line of inquiry would compare WTP measures for high- versus low-value beef cuts, and discern strategies to add value to lower valued ones, given producers’ difficulties in gaining premiums for parts other than steaks and tenderloins.

Public scholars have many important roles to play, particularly in verifying the boundaries of credible claims and identifying the conditions and management practices under which sustainability benefits are realized. For example, in what ways and under what conditions are PR products healthier and their production more environmentally and animal friendly, and under what conditions are they not? What management practices maximize or diminish these benefits? How do these management practices differ in cost and quality of life for farmers?

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Appendix: Definitions and Informational Messages in Surveys

Definitions

- "Pasture-raised" animals spend much of their lives outdoors, in an open space, where they forage for much of their own food.
- "Confinement-raised" animals spend most or all of their lives housed indoors or in a small area, where their food is brought to them.

Messages

- *Confinement message*: Raising animals in confinement makes efficient use of resources. Research has shown that cattle raised in confinement generally produce more per animal, per acre, and per pound of animal waste.
- *Animal welfare message*: Raising animals on pasture is good for the animals' welfare. Research has shown that being raised outdoors can decrease animals' health problems, stress levels, and anti-social behaviors.
- *Environment message*: Raising animals on pasture is good for the environment. Research has shown that pastures create less soil erosion and less water pollution than row crops, which are the primary feed source for confinement operations.