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Consumer Preferences for Pasture-Raised Animal Products: Results from Michigan

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The pasture-based model of agriculture potentially offers opportunities for small- and medium-scale livestock producers in local, regional, and national markets. Our data indicate that many consumers value the attributes associated with locally produced pasture-raised products. We used ordered probit and binary probit analyses of these data to identify the demographic segments that showed the greatest interest in these attributes. This interest suggests a broad education and marketing effort to articulate salient attributes and to differentiate and increase the availability of these products in the marketplace.

Animal agriculture across the U.S. and in Michigan is undergoing dramatic changes, including the increasing consolidation of production and processing systems with a concomitant decline in the number of livestock-producing farms. According to 2002 Census of Agriculture data, Michigan cattle-calf, hog, and dairy farms all declined in number between 1997 and 2002. Much of this loss was from small- and medium-scale farms, while large-scale farms (defined as 500 or more cattle-calf, 5,000+ hogs, or 500+ dairy cows) increased in number over that same period. Similar patterns are seen in the United States as a whole. Given the slim profit margins commonly available in commodity markets, it is not surprising that farms producing larger volumes are more likely to survive. Yet the loss of small- and medium-scale farms has been associated with many negative social and economic effects in rural communities (Goldschmidt 1947; Gomez and Zhang 2000; Lobao 1990; Lyson, Torres, and Welsh 2001; MacCannell 1988).

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Funding for this research comes from the endowment of the C.S. Mott Chair of Sustainable Agriculture at Michigan State University (MSU). Christopher Wolf, Associate Professor, Department of Agricultural Economics at MSU, provided early guidance on analytical methods. Three anonymous reviewers provided helpful comments and suggestions. All errors or oversights are our own.

Pasture-based (PB) livestock agriculture is an alternative production system that is particularly well-suited to small and medium-sized farms, and may also provide an important opportunity to reinvigorate rural communities. Farms adopting the pasture-based model can capitalize on product differentiation rather than on low cost strategies (Porter 1985); exploiting niche markets and the demand for quality and “artisanal” meats and other animal products while avoiding direct competition with the commodity products widely available. In addition, pasture-based production may offer opportunities for beginning or transitioning farmers, due to generally lower start-up costs, debt, and capital investment (Honeyman 1996; Kriegl n.d.)

Pasture-based livestock production, which differs from the more common confinement model in that the animals spend the majority of the growing season outside and foraging for significant portions of their diets, has a number of attributes, both documented and perceived, that are used in product differentiation. Pasture-based agriculture is widely seen as being more humane—e.g., the Humane Society of the United States cites pasture-raised as a more humane alternative to confinement operations. Raising animals outdoors may result in less stress and anti-social behavior and improved health for the animals (Cox and Cooper 2001; Goldberg et al. 1992; Krohn and Munksgaard 1993; Miller and Wood-Gash 1991; Wells, Garber, and Wagner 1999; Wilson et al. 2002). Pasture-based farmers generally forego the use of sub-therapeutic antibiotics and hormones, which are commonly used in confinement operations (Hutchins 2001; Mellon, Benbrook, and Benbrook 2001). Pasture-based agriculture may also offer improved ecosystem services. Compared to row-crop production, pastures have been shown to reduce sediment erosion (Digiacoimo et al. 2001) and phosphorus runoff (Bishop et al. 2005; Rotz

et al. 2002) while enhancing carbon sequestration (Guo and Gifford 2002).

Prior research suggests that animal products may be promoted on at least two broad dimensions: process attributes (Caswell 1998) describing *how* the animal was produced (Armah and Kennedy 2000; Dupuis 2000; Phan-Huy and Fawaz 2003) and community or “local” attributes (Maynard, Burdine, and Meyer 2003) such as *by whom* or *where* the animal was raised. Both types are credence attributes (Darby and Karni 1973), distinct from “product” attributes such as appearance and taste (which would be examples of search and experience attributes, respectively). Indeed, a growing body of literature, much of it from Europe, discusses growing demand for food that is “re-embedded” in nature and community (Murdoch, Marsden, and Banks 2000; Barham 2002; Goodman 2004; Sage 2003). For simplicity, we will refer to these as (i) “how” and (ii) “who” attributes, respectively. It is important to note, however, that these two dimensions of attributes are potentially distinct: for example, a heavily polluting feedlot that mistreats its animals could promote itself as being local or a family farm, evoking attributes desired by a niche of consumers. Conversely, grass-fed beef from Argentina could emphasize the “how” attributes while having no connection to communities in which products are sold. Some studies suggest that consumers value “how” attributes more highly than “who” attributes (Pirog 2004; Thilmany, Grannis, and Sparling 2003), although one study (Maynard, Burdine, and Meyer 2003) finds a majority of consumers willing to pay a premium for a number of locally produced meat products.

In addition, recent studies have revealed a broad array of demographic variables that are linked to interest in or demand for either “naturally” or locally grown animal products, suggesting a great potential market. Nayga (1996) reports that race, gender, household location, education, and income are significant factors in explaining consumers’ perceptions of the safety of hormones and antibiotics, and presumably of demand for products not using these practices. Another study (Thilmany, Grannis, and Sparling 2003) finds variables such as age, income, and marital and work status associated with demand for natural pork. Demand for pastured poultry has been related to consumers’ income and education levels (Food Processing Center 2001). We know of only a handful of studies expressly measuring demographic effects upon demand for local animal products. For example Maynard, Burdine, and Meyer (2003) find that being single, a young

adult, and having children in the household impacts willingness to pay for a variety of local meat products. The Food Processing Center (2001) study finds rural residents are more likely to rate locally grown as “extremely important” than are urban dwellers. Looking beyond animal products to local foods in general, studies looking at local or direct markets find that variables such as age, race, gender, education, marital status, and household location and income are linked to interest or patronage for a variety of food products (Govindasamy and Nayga 1997; Wolf 1997). The literature on demand for local foods in general is well summarized by Brown (2003), while the literature for local meat and animal products is rather sparse and emerging.

Previous research in Michigan (Conner and Hamm 2005) indicates that many smaller-scale pasture-based farmers are finding some success in promoting their products in direct or local markets. The promotion and differentiation of these products were often based upon process attributes related to “natural,” produced with high regard for animal welfare and ecological stewardship and without sub-therapeutic antibiotics or artificial hormones. Pasture-based farmers explained to consumers their ideas concerning the importance of buying locally, from a family farm and knowing the producer. However, considering the limited time and budgets available to small-scale farmers for promotion, the importance for them to further hone their promotional efforts, with a continued emphasis on the “how” and “who” attributes, as well as targeting those most likely to purchase their products, is clear. Thus we ask the following questions: Is there potential to generate increased consumer awareness of and support for pasture-raised animal products?¹ If so, which demographic segments are most interested in local and/or pasture-raised animal products? Answering these questions is the first step in determining the most effective way for small-scale farmers to reach these consumers.

We began our research by conducting a statewide poll of Michigan residents in order to identify consumer attitudes toward various claimed attributes of pasture-raised animal products. A series of binary probit and ordered probit analyses of these data were then conducted in order to determine if specific demographic market segments find these attributes important.

¹ In this paper we use pasture-based (PB) to describe farms, farmers, and production systems and pasture-raised (PR) to describe animals or products derived from those production systems.

Methods

Survey Questionnaire

In our survey, respondents were asked about the importance of pasture-raised (PR) attributes as previously identified by farmers (Conner and Hamm 2005) and about health perceptions of pasture-raised products and barriers to further purchase of pasture-raised products. The data collection was commissioned as part of the quarterly “State of the State” Survey administered by the Institute for Public Policy and Social Research (IPPSR), Michigan State University (MSU) in the fall 2005 Survey (Hembroff and Silver 2005). The survey included nine questions on consumer preferences for animal products (written by the authors of this paper) and a set of demographic questions (written by IPPSR). According to IPPSR, “the referent population is the non-institutionalized, English-speaking adult population of Michigan age 18 and over. Since the survey was conducted by telephone, only persons who lived in households that had telephones had a chance of being interviewed.”² A total of 988 people were interviewed. The refusal rate was 21.5 percent and the margin of error was ± 3.1 percent (95-percent confidence level). Demographic variables consisted of age, gender, income, education, marital status, employment status, labor union affiliation, urban/rural, race, and political affiliation.

Six questions asked respondents to rate on a five-point Likert-type scale (with 1 = not important; 2 = not very important; 3 = neither; 4 = somewhat important; 5 = very important) the importance of the following six attributes when buying animal products:

“How” attributes:

- Animals are humanely treated
- Raised without hormones or antibiotics
- Raised in an environmentally friendly way.

“Who” attributes:

- Raised in Michigan
- Raised on a family farm
- Knowing the farmer who raised it.

Respondents were then provided with a definition of pasture-raised³ animal products and asked how often they purchase these items: always or most times, sometimes, rarely, never. They were then asked, in an open-ended question, to give the top two reasons why they never buy, or do not buy more, pasture-raised products. Finally, they were asked if they agreed with a statement that pasture-raised products are healthier for consumers than are products from animals reared in confinement. Copies of the questionnaire are available from the authors upon request.

Data Analysis and Model Specifications

In addition to identifying overall consumer preferences for pasture-raised animal attributes, we used ordered probit and binary probit analyses to identify the particular demographic segments that find these attributes most important. This procedure was used given the discrete nature of the dependent variables in these analyses. Both probit procedures assume the disturbance term has a standard normal distribution. In practice, this assumption, as opposed to a logistic distribution (the logit model), will usually result in similar estimates (Greene 2003).

First, we used an ordered probit procedure to determine how the demographic characteristics of consumers affect their preference for the six attributes of pasture-raised animal products described in the previous section, with particular attention to the marginal effect of the variable on the probability of responding that an attribute is “very important.” Next, since few products offer or promote these attributes singly—e.g., humane but not environmentally friendly—we also used a binary probit analysis to identify the demographic characteristics of consumers who are most interested in the bundle of attributes associated with *how* the animals were raised (*how_very*), the bundle of attributes associated with *where* or *by whom* the animals were raised (*who_very*), as well as all six of these attributes together (*all_very*) (Table 1). Binary probit models are used for dependent variables that have only 0 and 1 as possible responses, like the three “very” variables

² http://www.ippsr.msu.edu/Documents/SOSSArchive/Methodpercent20reportpercent20PDF/soss39_meth.pdf

³ The definition was worded as follows: “Pasture-raised meat and dairy products are from animals that are raised out in pastures, not in confined feeding operations. Examples of pasture-raised products are free-range eggs or grass-fed beef.”

Table 1. Coding and Names for Transformed Variables.

New variable name	Variable description
how_very	Coded 1 if respondent said all three “how” attributes are “very” important. Coded 0 otherwise.
who_very	Coded 1 if respondent said all three “who” attributes are “very” important. Coded 0 otherwise.
all_very	Coded 1 if respondent said all six attributes are “very” important. Coded 0 otherwise.

shown in Table 1. While some information was lost in the transformation of these “very” variables (i.e., any response other than “very important” is treated the same), this analysis reveals demographic characteristic of those who most highly value these bundles of attributes and therefore are more likely to purchase the products.

Ordered probit allows for analysis of multiple but discrete values of the dependent variable while maintaining the ordinal nature (in this case that “very” is more important than “somewhat,” and so on). Ordered probit analysis calculates a set of coefficients for the explanatory variables plus a set of cut points. These cut points are ancillary parameters, taking the form k_1 to k_j for a model with $j+1$ values of the dependent variable (in this case, four cut points and five responses). The probability of outcome J is given as

$$(1) \Pr(Y = i) = \Pr(K_{i-1}) < (b_1x_1 + b_2x_2 + \dots + b_nx_n + u) \leq \Pr(K_i),$$

where u is assumed to be normally distributed. In this analysis, we estimate the coefficient for each regressor on the level of response for each of the six attributes, the cut points. Additionally, we calculated the marginal effect of the regressor upon the probability that the respondent said the attribute was very important, dY/dx_i , where y equals the probability that the response was 5 (very important) and x_i is a vector representing each regressor. For the dummy variables (which include all variables other than age, income, education, and HHadult) the marginal effect, dY/dx_i , measures the change in Y as x changes from 0 to 1. For non-dummies, the marginal effect at each regressor’s mean value

is calculated. A positive sign on the marginal effect indicates those with this attribute are more likely to have responded “very important.”

Both the ordered and binary probit analyses were conducted using the STATA software package. For the ordered probit models, the dependent variables were:

- the three “how” attributes: (i) humane animal treatment (variable name = “humane”); (ii) raised without hormones or antibiotics (“antibio”); (iii) environmentally friendly (“envi-ron”);
- the three “who” attributes: (i) raised in Michigan (“MIgrown”); (ii) raised on a family farm (“famfarm”); (iii) knowing the farmer who raised it (“knowfarm”).

All of the ordered probit analyses retained the five-point Likert-type-scale responses. The dependent variables for the binary probit analyses were the three dummy variables—“how_very,” “who_very,” and “all_very”—defined above.

The independent variables (regressors) for both the ordered and binary probit analyses include both continuous and dummy variables (Table 2). Continuous variables include the age, years of education, household income (calculated as the midpoint of a category), and the number of household adults for each respondent. Dummy variables, coded 1 if the respondent is or has that attribute include gender (female), religion (catholic, protestant, no religion), political party (Republican, Democrat), ideology (liberal, conservative), race (white, black), employment status (works full time, works part time, homemaker, and other work category), labor union affiliation (“pastunion”), community type (urban, rural, small town), and marital status (mar-

Table 2. Description of Demographic Variables for Probit Analyses.

Variable name	Description of variable (all responses are self-identified)	Sample mean
Age	Respondent's age, 2005 minus year of birth	59.97
Income	Midpoint of income category	37,139.43
Education	Years of education, coded as 14 for some college, 16 of Bachelor's Degree, 18 for Masters, 20 for Doctorate	14.25
HHadult	Number of adults in household	2.14
Female	Dummy variable, 1 = female, 0 = male	0.55
White	Dummy variable, self-identified, 1 = white, 0 otherwise	0.85
Black	Dummy variable, self-identified, 1 = black, 0 otherwise	0.12
Rural	Dummy variable, self-identified, 1 = lives in rural area, 0 otherwise	0.26
Smalltown	Dummy variable, self-identified, 1 = lives in small town, 0 otherwise	0.28
Urban	Dummy variable, self-identified, 1 = lives in urban area, 0 otherwise	0.12
Workfull	Dummy variable, self-identified, 1 = works full time, 0 otherwise	0.47
Homemaker	Dummy variable, self-identified occupation 1 = homemaker, 0 otherwise	0.11
Retired	Dummy variable, self-identified occupation, 1 = retired, 0 otherwise	0.17
Pastunion	Dummy variable, self-identified, 1 = has past affiliation with labor union, 0 otherwise	0.26
Married	Dummy variable, self-identified marital status, 1 = married, 0 otherwise	0.62
Divorced	Dummy variable, self-identified marital status, 1 = divorced, 0 otherwise	0.08
No_religion	Dummy variable, self-identified religion, 1 = not religious/no religion, 0 otherwise	0.09
Protestant	Dummy variable, self-identified religion, 1 = Protestant, 0 otherwise	0.51
Catholic	Dummy variable, self-identified religion, 1 = Catholic, 0 otherwise	0.29
Republican	Dummy variable, self-identified political party affiliation, 1 = Republican, 0 otherwise	0.29
Democrat	Dummy variable, self-identified political party affiliation, 1 = Democrat, 0 otherwise	0.29
Conservative	Dummy variable, self-identified political ideology, 1 = conservative, 0 otherwise	0.29
Liberal	Dummy variable, self-identified political ideology, 1 = liberal, 0 otherwise	0.52

ried, single, divorced). In general, these dummy variables represent the categories with the largest numbers of respondents: each dummy represents at least seven percent of respondents.

For each demographic category, the dummy variables are contrasted with other responses for that question. For example, “black” and “white” are contrasted with categories such as Asian, Pacific Islander, Hispanic and Native American. Religion variables are contrasted with Muslim, Jewish, other non-Christian, other Christian, and unable to classify. Political party variables contrast with “something else” and independent. Ideology variables contrast with “other” and “neither.” Marital variables contrast with widowed, separated, member of unmarried couple, and other. Community type contrasts with suburb and other. Employment contrasts with work and go to school, school full time, disabled, in the armed services, have job but did not work last week, and unemployed. All questions had “no response,” “refused,” and “do not know” answers as well, which were coded as missing data.

Four additional variables were created. The squares of income, education, and age are included in the analysis to account for non-linearities in these variables (e.g., middle-income people may behave or believe differently than high- or low-income people). “Female_employed” is a dummy variable coded 1 if the respondent is both female and employed, 0 otherwise: females in the workforce have been identified as an important driver of demand for food products (Schroeder and Mark, 2000; Kezis et al. 1998). A series of likelihood-ratio tests was employed to test whether these four additional variables significantly improved the models. In all cases, this test indicates that these variables do not significantly improve the models’ fit, and so are not included in the final models presented below. Similarly, a number of nested models were run that removed variables that have not been shown in previous studies to influence consumer behavior for local or natural animal products (e.g., union or political affiliation); in each case, these variables were found (again by likelihood-ratio test) to significantly contribute to the model and were therefore retained.

Finally, several variables representing small categories (e.g., Jewish, Muslim) were dropped at the outset from the analysis due to identified recurring collinearity issues. Two other variables (“parttime”

and “workother”) were dropped for the same problem following additional likelihood-ratio testing.

Results

Descriptive Statistics

Approximately two-thirds of respondents stated that humane animal treatment, hormone/antibiotic free, and environmentally friendly were very important attributes of pasture-raised animal products, while roughly another quarter said these attributes were somewhat important. About half of respondents said Michigan-grown and family farm were “very” or “somewhat” important, and one-third said knowing the farmer was either “very” or “somewhat” important to them (Table 3).

Producers could potentially offer these attributes as bundles, e.g., offering all three “how” attributes, all three “who” attributes, or all six attributes in one product. With this in mind, we examined the degree to which consumers expressed interest in these combinations and found strong consumer interest in all “how” attributes, with less interest in “who” attributes. For example, more than two-thirds (78 percent) of respondents said that all three attributes concerning “how” the animals are raised (humane, no hormone/antibiotic use, and environmentally friendly) were “very” or “somewhat” important, but only two percent said none of these “how” variables were important. Regarding the “who” attributes, 22 percent said all three variables concerning who raised the products (family farm, Michigan-grown, knowing farmer) were “very” or “somewhat” important, while 26 percent said none of these “who” variables were important. Finally, 20 percent said all six attributes were “very” or “somewhat” important, while only one percent said none of the six attributes were important.

The last few questions on the survey specifically asked consumers about their behaviors and perceptions regarding pasture-raised products. When asked how frequently they buy pasture-raised (PR) products, 39 percent said always or most times, while 35 percent said sometimes (Table 4). All respondents who did not answer “always or most of the time” were then asked an open-ended question: “What are the main reasons why you have never purchased, or do not purchase more, pasture-raised animal products?” (Table 5). The top reasons given

Table 3. Rating of Animal Attributes from Consumer Survey (n = 988).

Attribute (variable name)	Very important	Somewhat important	Neither/ neutral	Not very important	Not impor- tant at all
Humane animal treatment (humane)	63	29	2	4	3
Raised without hormones or antibiotics (antibio)	63	24	3	7	3
Environmentally friendly (environ)	65	28	2	4	1
Raised in Michigan (MIgrown)	23	29	3	27	18
Raised on a family farm (famfarm)	30	33	4	25	9
Knowing the farmer who raised it (knowfarm)	17	17	2	32	32

Note: Percentage values may not add to 100 due to rounding.

Table 4. Reported Frequency of Purchase of Pasture-Raised Products.

Reported frequency	Always or most of time	Some of the time	Rarely	Never	Don't know
Number of responses (valid percent)	348 (39 percent)	316 (35 percent)	152 (17 percent)	85 (9 percent)	86 (n/a)

Table 5. Top Reasons for Not Purchasing or Not Purchasing More Pasture-Based Animal Products (n = 494*).

Reason given	Lack availabil- ity	High cost	Not certain if pasture- raised	Lack of interest/ not important	Vegetarian/ do not eat meat	Do not do shop- ping	Do not trust products
Percent of valid responses	25	22	17	14	5	4	4

* 145 don't know/refused. Note that because those consumers who always buy pasture-raised products were not asked this question, 349 responses were not applicable.

include lack of availability, price, not aware or not certain if item is pasture raised, and lack of interest. Pasture-raised products also were perceived by respondents to be healthy: more than 75 percent of respondents stated that they strongly or somewhat agree with the assertion that pasture-raised products are healthier for consumers than are confinement raised products (Table 6).

Ordered and Binary Probit Analyses

A number of demographic variables effect how the consumers rated the various attributes, although no single regressor significantly affects all six. In the ordered probit analysis (Table 7), only “Female” is significant⁴ with a positive sign for five of the six attributes; “knowing the farmer” is the sole exception. Education and income are significant for all three “who” attributes, and the variables Workfull and Conservative were significant for all three “how” attributes, with all carrying a negative sign. Age and Pastunion were significant and positive for Family Farm, whereas both black and white respondents indicated that this attribute was not important. Respondents who worked full time (Workfull), Homemakers, and those who were retired were significantly positively associated with Michigan-grown, whereas Republicans were not. Finally, Conservatives were significant and positive for humane (as were Liberals) and antibiotic/hormone free (as were those with no religious preference). For brevity, variables that were not statistically significant for any attribute are omitted from Table 7.

In the binary probit analysis (Table 8), only married is significant for all three “very” variables, with

all carrying a negative sign. HHadult and Home-maker were significant and positive for who_very and all_very, while the White, Black, Married and Divorced variables were negative and significant for those who_very and all_very categories. Those who worked full time and Republicans were significant for the bundle of how_very, but these results carried a negative sign; Conservatives, Liberals and those indicating No religion were significant and positive for this cluster of “how” attributes. Again, only those variables significant in any equation are included in Table 8.

Discussion

We conducted this study in order to address two basic questions about the market for pasture-raised animal products: Is there potential in the marketplace to generate increased consumer awareness of, and support for, pasture-raised animal products? And which demographic segments, if any, are most interested in local and pasture-raised animal products? Our research shows that Michigan consumers place strong importance on process attributes such as humane animal treatment, hormone and antibiotic free, and environmentally friendly, all of which may, with appropriate management, be credibly supplied by pasture-raised products. Fewer consumers find the “who” attributes important, a finding consistent with earlier studies (Pirog 2004; Thilmany, Grannis, and Sparling 2003).

Although the consumers in our survey believed that they were already buying pasture-raised products, given the prevalence and relative availability of pasture- versus confinement-raised products in most Michigan stores, this almost certainly reflects a misunderstanding as to the nature of products actually being purchased. It is difficult to measure

⁴ All significance levels are at the $\alpha = 0.1$ level or greater (see Tables 7 and 8).

Table 6. Agreement with the Statement, “Pasture-Raised Products are Healthier for Consumers than Products from Confined-Feeding Operations.”

Response	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	Don’t Know
# of responses	377	372	50	87	33	65
(valid percent)	(38%)	(38%)	(5%)	(9%)	(3%)	(7%)

Table 7. Results of the Ordered Probit Analysis.

	Dependent variable					
	Humane		Antibio		Environ	
Pseudo R ²	0.0808		0.0751		0.0643	
Log likelihood	-579.7310		-604.8989		-558.1892	
Independent variables	β	dY/dx_i	β	dY/dx_i	β	dY/dx_i
Age	0.0095**	0.0035**	-0.0053	-0.0020	-0.0052	-0.0020
Income	0.0019	0.0007	0.0034	0.0013	-0.0009	-0.0003
Education	-0.0224	-0.0083	0.0020	0.0007	-0.0232	-0.0087
Female	0.5349***	0.1995***	0.4857***	0.1837***	0.4392***	0.1657***
White	-0.1367	-0.0497	-0.1389	-0.0514	-0.4037	-0.1425
Black	-0.1184	-0.0446	0.3390	0.1210	-0.2973	-0.1149
Rural	0.1717	0.0628	0.2032	0.0754	-0.0140	-0.0053
Workfull	-0.3934***	-0.1471***	-0.2802**	-0.1061**	-0.2351*	-0.0887*
Homemaker	-0.1551	-0.0587	0.1898	0.0695	-0.0731	-0.0277
Retired	-0.1391	-0.0521	-0.1755	-0.0669	0.0401	0.0150
Pastunion	-0.0097	-0.0036	0.2278**	0.0850**	0.0911	0.0341
Divorced	0.0372	0.0137	0.2978	0.1069*	-0.1154	-0.0440
No_religion	0.4121	0.1403*	0.6464**	0.2119***	0.0214	0.0080
Protestant	0.2431	0.0905	0.3139*	0.1185*	-0.1257	-0.0470
Republican	-0.4408***	-0.1669***	-0.5007***	-0.1920***	-0.4626***	-0.1769***
Democrat	-0.0262	-0.0097	-0.2207*	-0.0840*	-0.0092	-0.0035
Conservative	0.1891*	0.0695*	0.1918*	0.0716*	-0.0100	-0.0038
Liberal	0.3272**	0.1156**	0.1938	0.0713	0.2463	0.0895*

Note: *, **, and *** denote significance at the 0.10, 0.05 and 0.01 levels, respectively.

availability of pasture-raised products because there is no standard definition and we know of no concerted effort to track their sales. However, organic meat and dairy products, which are subsets of pasture-raised (U.S. organic standards require access to pasture), compose less than one percent of U.S. sales, according to an analysis of data from Bureau of Labor Statistics and Knudson (2007). A recent *New York Times* article stated that eggs not produced by birds in small cages compose about five percent

the market (Severson 2007). In our experience here in Michigan, pasture-raised products are generally more available in natural foods and specialty stores than in mainstream supermarkets. Furthermore, we shared these results with several agricultural economists, all of whom agreed that these numbers do not reflect their understanding of product availability and purchase patterns.

In general, the descriptive statistics suggest the potential for market expansion of pasture-raised

Table 7. Results of the Ordered Probit Analysis (Continued).

	Dependent Variable					
	MIgrown		Famfarm		Knowfarm	
Pseudo R ²	0.0368		0.0431		0.0351	
Log likelihood	-914.7132		-864.8683		-913.0142	
Independent variables	β	dY/dx_i	β	dY/dx_i	β	dY/dx_i
Age	0.0035	0.0011	0.0085**	0.0030**	0.0025	0.0005
Income	-0.0048**	-0.0015**	-0.0062**	-0.0022**	-0.0057**	-0.0012**
Education	-0.0684***	-0.0217***	-0.0565***	-0.0199***	-0.0580***	-0.0126***
Female	0.3303***	0.1027***	0.3596***	0.1245***	0.0264	0.0057
White	-0.1960	-0.0649	-0.5399**	-0.2028**	-0.2917	-0.0704
Black	-0.2002	-0.0603	-0.6789**	-0.2035***	-0.2198	-0.0437
Rural	0.1999	0.0649	-0.0447	-0.0157	0.2805**	0.0645**
Workfull	0.2918**	0.0942**	0.1537	0.0546	0.0334	0.0073
Homemaker	0.3175**	0.1083*	0.1440	0.0521	0.2800*	0.0682
Retired	0.3168**	0.1052**	0.1570	0.0563	-0.0005	-0.0001
Pastunion	0.0670	0.0214	0.2204**	0.0784**	0.0687	0.0151
Divorced	0.0731	0.0236	0.1517	0.0550	-0.1437	-0.0294
No_religion	0.1430	0.0472	-0.0680	-0.0237	0.1649	0.0386
Protestant	0.0310	0.0098	-0.0961	-0.0340	0.1978	0.0426
Republican	-0.0380	-0.0120	-0.0531	-0.0186	-0.2831*	-0.0581***
Democrat	0.1684	0.0545	0.0505	0.0179	-0.2188*	-0.0456**
Conservative	0.0665	0.0212	0.0680	0.0241	0.3314***	0.0753***
Liberal	-0.0728	-0.0228	0.0124	0.0044	0.0568	0.0126

Note: *, **, and *** denote significance at the 0.10, 0.05 and 0.01 levels, respectively.

animal products. Consumers appear to value pasture-raised attributes but believe—likely in error—that they are already commonly consuming them. This potential market could be further developed if consumer awareness and knowledge were increased, perhaps by a combination of private and public strategies to articulate salient attributes and to differentiate and increase the availability of pasture-raised products in the marketplace.

However, the results of our ordered probit analy-

sis indicated that very few demographic variables tested were positively associated with described attributes of pasture-raised animal products. Only females found five of the six attributes important (the exception being knowing the farmer), although some other demographics did indicate positive support for a number of individual attributes, e.g., Michigan-grown (Full-time workers, Homemakers, and Retired), Family Farm (past union members and rural residents), and humane treatment of animals

Table 8. Results of the Probit Analysis.

	How_very	Who_very	All_very
Pseudo R ²	0.086	0.119	0.159
Log likelihood	-398.2164	-158.382	-118.992
Independent variables	dF/dx	dF/dx	dF/dx
Education	-0.0043	-0.0074*	-0.0046
HHadult	0.0505	0.0310**	0.0240**
Female	0.1934***	-0.0075	-0.0023
White	-0.1844	-0.1160*	-0.0965*
Black	-0.1304	-0.0554*	-0.0399*
Workfull	-0.1064*	0.0322	0.0153
Homemaker	-0.0523	0.1125**	0.1189***
Pastunion	-0.0223	0.0186	0.0267*
Married	-0.0962*	-0.0737***	-0.0843***
Divorced	-0.0393	-0.0620***	-0.0386**
No_religion	0.1741*	-0.0071	0.0153
Republican	-0.1885***	-0.0295	-0.0278
Conservative	0.1130**	0.0185	0.0213
Liberal	0.1436**	0.0143	0.0272

Note: *, **, and *** denote significance at the 0.10, 0.05 and 0.01 levels, respectively.

(both Conservatives and Liberals). The results of the second probit analysis further reinforced this pattern. Overall, these results suggest possible benefits to enhanced production and marketing of these products.

At present, farmers selling in direct markets (farmgate, CSA, or farmers market) can accompany their products with a personal narrative of how the food was produced, pointing out their products' unique attributes and telling the story of their farm, the animals, and the land they were raised on. However these face-to-face interactions in supplying alternative animal products and in meeting consumers' information needs have limits. Only a small subset of consumers is likely to seek out and establish long-term relationships with pasture-based producers, with most consumers preferring to purchase their pasture-based animal products in more mainstream retail sites like supermarkets (Food Processing Center 2001). In these settings, food labels and educational materials allow the food

narrative to extend beyond the farm gate, taking the place of the farmer in reaching out to consumers and transmitting information about quality and underlying values (Barham 2002). This is particularly important because consumers have no way of differentiating pasture-based animal products, based on traditional visual or taste cues, from those that are conventionally raised; pasture-raised is a credence attribute (Darby and Karni 1973). Labels thus can also provide a way to highlight the particular production practices and ethics—e.g., consideration for the animal's welfare or environmental sustainability—associated with the product.

However, there are problems associated with relying solely on labels and printed educational materials to communicate with consumers. Without an understanding of how these messages are received by consumers, labeling efforts may result in little more than "greenwashing" (Barham 2002; Ottman, Stafford, and Hartman 2006). To avoid this, companies are increasingly turning to the Internet

to supplement traditional labeling and marketing efforts. This medium can be used both as a means to transmit and generate interest in a product, and to provide access to considerable repositories of information (Ottman, Stafford, and Hartman 2006). In addition, the use of “free advertising” when the labels and farms are featured in regional and national magazines shows much promise in reaching potential customers (Buhr 2004).

Given that most consumers are likely to continue to buy animal products for at-home consumption from mainstream grocery stores and supermarkets, meeting this market potential will mean making these products more available from these outlets. The most broad-reaching strategy would probably be a labeling and promotion program for pasture-raised products. To the extent that truthful, verifiable standards and claims concerning the three “how” attributes (humane, no hormone/antibiotic, environmentally friendly) and health benefits can be included on the label and promotional information, these data indicate that these claims could be used to increase purchases. The current debate on what should constitute USDA grass-fed standards (Burros 2006) and competition among “humane” standards highlight the growing importance of these issues. Similarly, verifiable claims on the individual “how” attributes, apart from an overall pasture-raised program, would further product differentiation and foster the ability of consumers to express these values in the marketplace.

Conclusions, Limitations and Future Directions

This research suggests potential growth in the market for differentiated animal products in Michigan. Pasture-raised (PR) products bundle many attributes that consumers find important. Less than half of respondents stated that price is a barrier to increased purchase of pasture-raised products, and less than one-fourth identified lack of interest. The fact that so many appear to mistakenly believe they are already buying these products offers a great opportunity for consumer education and promotional work to enable correct identification and purchase of these products. Promotion and education would be made more effective if guided by greater understanding of what consumers understand and believe about how animals are raised for food.

A key limitation of this study is the potential of social-desirability bias in consumers’ rating of product attributes. In future research, this bias could be addressed by use of indirect questions (Alpert 1971; Fisher 1993). Similarly consumers who believe they are buying pasture-raised products could be asked for specific examples of products as a means of understanding why so many consumers hold this apparently mistaken belief.

The prevalent interest in “how” over “who” attributes requires reflection on the ability of pasture-based agriculture to foster farm-scale diversity (with concomitant benefits to rural areas) and greater embeddings in community. In the long term, growth in demand will no doubt draw new entrants in the market, including large farms with no connection to the locale. Predictions for organic agriculture likely hold true for pasture-raised as well: “Structure of agriculture concerns need to be explicitly built into strategies that promote organic food from small-to-moderate sized family farms. Current forces will lead the current organic food and agriculture system to increasingly resemble the evolving conventional system” (Dobbs, Shane, and Feuz 2000). The role of personal relationships, based on shared values between farmers and customers, which foster customer loyalty and demand for “good food” (as discussed in Sage 2003) merits further inquiry from scholars interested in fostering scale diversity and enhancing pasture-based agriculture’s contributions to the social and economic (in addition to environmental) sustainability of livestock agriculture.

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