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Grass-Fed Beef: How is it Marketed by US Producers?

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Abstract

Increased interest by consumers and producers in grass-fed beef has led to recent expansions in this segment of the beef industry. A mailed survey was used to determine the "what, where and how" of grass-fed, beef marketing in the United States. The most important factors in farmers' decisions on when to harvest and sell cattle are animal weight and consumer demand. Most farmers use multiple venues for advertising and marketing their beef. Direct sale to consumer is the most commonly used marketing channel. Farm experience, diversification, farm size, production system, and production region impact marketing channel choice.

Keywords: grass-fed beef, marketing channel, transaction costs

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Introduction

The grass-fed beef segment of the US beef industry has garnered increased interest among consumers and farmers in recent years. The interest among consumers has resulted primarily from health, environmental, animal welfare, and local agricultural production concerns while the greater interest among farmers has resulted from perceptions of increased consumer demand, the potential for profitable production, and a desire for involvement in sustainable agricultural systems. Because grass-fed beef represents a small percentage of the total beef sold in the United States formalized markets have not been extensively developed. Thus, for grass-fed beef farmers, marketing is a critically important activity.

Much of the grass-fed beef sold in recent years has been marketed via direct sale from farmer to consumer on the farm or via farmer's markets, as well as via direct sale to restaurants and grocery stores. The extent of knowledge, however, of (1) how farmers decide when to market grass-fed beef, (2) forms in which the beef is marketed, (3) how farmers advertise their beef, (4) the primary sources of information for determining grass-fed beef prices, and (5) the marketing channels used for grass-fed beef is still low. This paper provides information on each of these issues. As demand for this beef product continues to expand, post-farm gate agricultural businesses will continue to respond as restaurants and retailers seek to procure adequate quantities of quality grass-fed beef for their customers. Post-farm gate agricultural businesses, current grass-fed beef producers, and potential grass-fed beef producers need information on current marketing practices used if they are to determine how to proceed in marketing and/or procuring product and coordinating marketing efforts.

Grass-fed beef currently commands a small percentage of the beef market, with Gwin (2009) estimating that less than 0.5% of the US beef herd was under a grass-fed system. Furthermore, most of the grass-fed beef farms are relatively small-scale, with results of our survey showing that the mean and median grass-fed beef farm raised forty and sixteen animals, respectively, to slaughter weight in 2012. The small-scale nature of the industry and thinness of markets suggest this industry produces a niche product, with producers using a number of different marketing outlets from direct-to-consumer to marketing directly to grocery stores and restaurants. Marketing grass-fed beef animals via conventional auction would not be common since few auction buyers would pay premium prices for the grass-fed label.

Claim standards for grass-fed ruminant livestock production were defined in the Federal Register (2007) as involving the feeding of grass and forage for the lifetime of the animal, with the exception of milk before weaning. Grasses, forbs, cereal grain crops in their vegetative pre-grain state, and browse constitute the entire diet. Grain and grain byproducts cannot be fed. Acceptable forms in which harvested forage may be fed include balage, haylage, hay, silage, crop residue without grain, and other roughage sources. Routine vitamin supplementation and minerals can be fed. The American Grassfed Association's (2014) standards for certification stipulate that the animals can be fed only grass and forage from weaning until slaughter, animals must be on pasture and not confined in feedlots, no growth hormones or antibiotics may be used, and animals must be "born and raised on American family farms." Thus, the USDA definition and the American Grassfed Association definition are similar in that animals must be fed only grass and forage post-weaning, but the latter is more stringent in that it disallows the use of growth hormones and antibiotics and requires that the animals be from American family farms.

System differences between grass-fed and grain-fed beef operations have resulted in differences in beef nutrient composition (Dayley et al. 2010; Leheska et al. 2008), with perhaps the most notable differences being the fat content. According to Dayley et al.'s (2010) review of grass-fed beef nutrition studies, grass-fed diets generally improve the antioxidant and fatty acid profiles of beef. Product differences from "conventional" grain-fed beef are a basis on which grass-fed beef is marketed to consumers.

Previous Grass-Fed Beef Marketing Studies

Most of the previous grass-fed beef marketing research has dealt with consumer preferences using experimental auctions (Umberger et al. 2002, Umberger et al. 2009; Xue et al. 2010), taste panels (Sitz et al. 2005), conjoint analysis (McKluskey et al. 2005), or contingent valuation methods (Conner and Oppenheim 2008). Overall, grain-fed beef has generally received more favorable sensory scores, though grass-fed beef has been preferred by some consumers (Umberger et al. 2002). Studies have shown health information to be of significant importance in determining willingness-to-pay for grass-fed beef (Conner and Oppenheim 2008; Umberger et al. 2009). Conner and Oppenheim (2008) found that consumers generally agreed that pasture-raised products were better for animal welfare, more environmentally friendly, and healthier to eat. Overall, the whole of this work appears to suggest that though most consumers prefer the taste of grain-fed beef, a market exists for grass-fed beef particularly because of its health and perceived sustainability benefits relative to grain-fed beef.

Martin and Rogers (2004) suggested that a number of challenges will need to be overcome for grass-fed beef to move from a niche product to wider acceptance, further asserting that innovative marketing promotion touting the health benefits of grass-fed beef could impact consumption. It seems that such promotion would need to originate at the farm level since there are few branded grass-fed beef products. We are aware of few studies that have addressed farmer marketing of grass-fed beef (Lozier et al. 2004; Steinberg and Comerford 2009). Lozier et al. (2004) surveyed 149 producers of "pasture-finished" beef in the United States and Canada. A slight majority sold their product seasonally versus year-round, with most selling to local individuals, followed by independent stores, followed by restaurants. They also determined the form in which most farmers sold their product, the price premium they received relative to conventional beef, and how the farmers advertised. Steinberg and Comerford (2009) conducted case studies of twenty-six grass-fed beef producers in the Northeastern United States. The marketing-related concerns they addressed were criteria for harvest, product packaging, and advertising. Our results build on those of Steinberg and Comerford (2009) and Lozier et al. (2004), providing more extensive and up-to-date estimates of marketing behavior in the industry. Furthermore, we provide insight into the types of producers using various marketing outlets.

The objectives of this study are to determine: (1) the importance of various factors farmers consider in deciding when to harvest or sell grass-fed cattle, (2) the percentages of farms selling grass-fed beef in various forms, (3) the methods whereby grass-fed beef farmers advertise their beef product, (4) the primary sources of market price information for grass-fed beef, (5) the marketing channels farmers use for selling their beef, and (6) the drivers of choice of marketing channel.

Methods

Mail Survey

A mail survey questionnaire was developed during 2013 to be administered to US grass-fed beef farmers. The ten-page questionnaire included questions dealing with farm structure, adoption of technology and management systems, animal selection for grass finishing, pasture and grazing management, reasons for entering grass-fed beef production, goal structure of grass-fed beef producers, marketing practices used, challenges facing grass-fed beef producers, and general demographic and farm financial information. A list of grass-fed beef farmers for survey was developed via an extensive Internet search of websites such as eatwild.com, the American Grassfed Association, Market Maker, general search of the Internet for farms individually advertising grass-fed beef, and other sites that might contain grass-fed beef farmer addresses. A total of 1,052 grass-fed beef farmer addresses were found. Dillman et al.'s (2009) tailored design method was followed in designing the survey. Farmers were first sent a personalized letter, questionnaire, and business-reply envelope via first class mail in July, 2013. Two weeks later, they were sent a postcard reminder. Two weeks hence, a second personalized reminder letter, questionnaire, and business-reply envelope were sent. Finally, two weeks later, another postcard reminder was sent. A total of 384 surveys were received. Considering returns that were either bad addresses or where the producer was no longer involved in grass-fed beef production, this constitutes an overall return rate of 41%.

Upon beginning this study, we did not have a good estimate of the total number of grass-fed beef farms in the United States, as the US Census of Agriculture has not published these numbers. Lozier et al. (2004) generated a list of 300 US and Canadian grass-fed beef farmers from Internet searches and other solicitation in 2001. A total of 187 grass-fed beef farms are included on the American Grass-Fed Association (2014) website. Our list of 384 respondents includes producers from all 50 states with the exceptions of AK, DE, HI, ND, and VT. Of the 187 grass-fed beef farms listed on the American Grassfed Association website, only one is listed in one of those four states, suggesting that these are not major grass-fed beef producing states. Overall, the distribution of our sample of grass-fed beef farms among states appears to be as one would expect from the population based upon observation of areas with greater interest in grass-fed beef (i.e., the Northeastern and Pacific Coast states).

A number of our survey questions asked respondents to characterize their marketing practices. Farmers were asked, "Which of the following terms would apply to the grass-fed beef produced by animals on your farm? (Circle all that apply)," with terms including Natural, Antibiotic-free, Hormone-free, Local, Lean, and Tender. Note that while some grass-fed beef marketers claim "hormone-free" beef, this label is not approvable by the USDA for meats. With sufficient documentation, "No hormones administered" may be approved by USDA for beef.

Respondents were asked, "How important are the following factors in your decision of when to harvest or sell your cattle?" The factors included: (1) market price, (2) immediate need for cash, (3) age of the animal, (4) weight of the animal, (5) body frame, (6) availability of forages (hay/pasture), (7) consumer demand, and (8) time of the year. Potential responses were elicited using a four-point Likert scale, including not important at all, somewhat important, very

important, and highly important. Asun et al. (2015) reviewed literature on the number of points that should be used in a Likert scale, acknowledging the contrasting opinions provided by previous studies. They suggest that four to seven points are most commonly used, with the need to avoid too few points (two or three) and a general lack of increased validity when increasing the number to more than seven. Some studies have suggested "balanced" scales where equal numbers of positive and negative responses are provided (Friedman and Amoo 1999). Studies have also discussed the semantic properties of adjectives used in Likert scales (e.g. Myers and Warner 1968; Mittelstaedt 1971).

Farmers who indicated they had sold grass-fed beef as meat in 2012 were asked, "In which form was the beef sold? (Circle all that apply)," with options whole carcass, whole side, quarter, mixed quarter, box – different sized, individual cut, hamburger, and other. Respondents were asked, "How do you advertise your product?," with options word-of-mouth, radio and/or TV, newspaper or magazine, Internet, email, direct mail, telephone, I do not advertise, and other. They were then asked, "What are your primary sources of information for market prices for grass-fed beef?," with options including other farmers; extension service; farm organizations; TV, radio or magazines; Internet; and other. It is noted that USDA-Agricultural Marketing Service began providing a monthly grass-fed beef report including prices for US grass-fed beef. The report, however, became available after the survey was complete. A survey conducted today would include the report as an option for sourcing grass-fed beef prices. Finally, respondents were asked, "Which of the following marketing channels do you use to sell your beef? (Circle all that apply)," with options direct sale to consumers; online/Internet; cooperative; restaurant; grocery stores; farmer's market; wholesalers and/or retailers; and dealers, brokers or meat packers.

Marketing Channel Selection

In this study, we analyze the adoption of eight different marketing channels for grass-fed beef, as listed in the previous paragraph. One option for estimating the drivers of adoption of each would be to estimate separate probit or logit models for each of the marketing channels. However, in such cases where there are multiple options that may be adopted, the error terms may be correlated and the estimates may not be efficient. The multivariate probit model, which is akin to the seemingly unrelated regression model but used instead for binary outcomes, may be used to overcome this deficiency (Greene 2000).

The multivariate probit model is structured as:

1) $y_{im}^{*} = \beta_m' X_m + \varepsilon_{im}, m = 1, \dots, M$
2) $y_{im} = \begin{cases} 1 \; if \; y_{im}^{*} > 0, and \\ 0 \qquad otherwise, \end{cases}$

where M is the number of equations and ε have a multivariate normal distribution with mean vector 0, covariance matrix R, and diagonal elements equal to 1. The Geweke-Hajivassiliou-Keane simulator is used to compute probabilities in this model. For more information on the specifics of this model, the reader is referred to Greene (2012). Examples of studies in agricultural economics that have used the multivariate probit model include Fletcher and Terza

(1986) in analyzing marketing alternatives for wheat farmers and Gillespie et al. (2004) in analyzing breeding technology adoption among hog farmers.

In addition to the multivariate probit model, a count data Poisson regression model is used to determine the drivers for the number of marketing channels used by farmers. Given that grass-fed beef is closer to a niche product than a commodity and there are few or no established grass-fed beef markets in some regions of the United States, farmers must pay close attention to marketing and perhaps sell in multiple markets. The Poisson model is designed to analyze count data, in our case the number of marketing channels used. The Poisson regression model as shown in Greene (2000, 880) is:

3) $Prob(Y_i = y_i) = \frac{e^{-\lambda_i}\lambda_i^{y_i}}{y_i!}$, $y_i = 0, 1, 2, \ldots,$

where it is assumed that the y_i's are drawn from a Poisson distribution and λ_i is the parameter estimate that is related to the regressors in a log-linear model, $\ln \lambda_i = \beta'x$. The Poisson regression model assumes that the variance of y_i is equal to its mean. In cases of overdispersion where the two are unequal, the negative binomial regression model has been proposed. We tested for overdispersion in the count of marketing channels used using the Lagrange multiplier test as discussed by Greene (2000, 885-886), but did not find evidence of overdispersion. Thus, we use the Poisson model for analyzing the count of marketing channels used.

Independent variables included in the multivariate probit and Poisson regression models include those indicating farmer demographics, farm diversification, farm size, production system, and region. The farmer demographic variable included was the number of years the farmer had been operating the grass-fed beef enterprise. Studies that have found impacts of years of experience on marketing outlet choice have included Park and Lohr (2006) with organic producers, Nyaupane and Gillespie (2011) with crawfish producers, and Sun et al. (2014) with wineries.

Farm and household income diversification measures included in the models were the percentage of household income from off-farm sources (*% Income Off-Farm*) and the percentage of farm income from grass-fed beef (*% Farm Income Grass-Fed*). Studies finding significant relationships between off-farm employment and marketing channel choice have included Gillespie et al. (2004) with cattle producers and Nyaupane and Gillespie (2011) with crawfish producers. Generally, higher percentages of income from off-farm work suggest less time available to devote to management of the farm and, hence, to the grass-fed beef enterprise. This would suggest the selection of fewer marketing channels and avoidance of channels with associated high transaction costs, as originally discussed by Coase (1937) and developed by Williamson (1979). For instance, direct sale to consumers involves individual transactions for most or all sales and, thus, significant time required for negotiation and providing information to individual buyers. Sales to restaurants and grocery stores involves significant transaction costs associated with providing information to the buyer, negotiating contracts whether formal or informal, and perhaps the buyer's monitoring quality, which could impose costs on the seller.

Studies that have found significant relationships between farm enterprise diversification and marketing channel choice have included Gillespie et al. (2004) and Davis and Gillespie (2007). Farm diversification can be used as a risk management tool (Robison and Barry 1987). Use of a

larger number of marketing channels would tend to diversify the marketing portfolio, a strategy that producers depending more extensively on the grass-fed beef enterprise could use to reduce risk. Furthermore, greater dependence on the grass-fed beef enterprise suggests more time available to devote to marketing, suggesting a more diversified marketing portfolio and selection of marketing channels that involve higher transaction costs such as direct sale to consumers and to restaurants and grocery stores.

Farm size measures included in the models were the number of grass-fed beef animals raised to harvest weight (*Cattle Raised*) and the total number of acres on the farm (*Acres*). Studies finding significant relationships between firm size and choice of marketing channel or method include Fletcher and Terza (1986) with wheat producers, Schmitz et al. (2003) with US stocker cattle, Park and Lohr (2006) with organic producers, and Sun et al. (2014). Greater volume allows transaction costs per unit sold to decrease and opens the opportunity for selling via channels that may demand higher volume, such as grocery stores, restaurants, and wholesalers. Larger-scale producers would not be expected to depend as heavily upon marketing channels with higher associated transaction costs, such as direct sale to consumers. Production system was included using a dummy variable indicating the farm was producing certified *Organic* beef.

Farm region variables were included, with *South* including AL, AR, FL, GA, KY, LA, MS, NC, SC, TN, VA, and WV. *Northeast* includes CT, DE, ME, MD, MA, NH, NJ, NY, PA, RI, and VT. *Pacific* includes CA, OR, and WA. *West* includes AK, AZ, CO, HI, ID, KS, OK, MT, NE, NM, ND, SD, TX, UT, and WY. The baseline *Midwest* includes IL, IN, IA, MI, MN, MO, NE, OH, and WI. Park and Lohr (2006) found differences in marketing behavior by region.

Results

Of the terms grass-fed beef producers believed applied to the beef they produced, the terms "hormone-free," "local," "natural," and "antibiotic-free" were chosen by over 93% of the producers (Table 1). Given the "local" nature of marketing of most grass-fed beef in the United States, the "local" label is not surprising. Furthermore, the "hormone-free" and "antibiotic-free" labels are consistent with American Grass-fed Association guidelines if "hormone-free" refers simply to no hormones being administered to cattle. Eighty-nine percent reported that "tender" applied while 65.5% reported that "lean" applied to the grass-fed beef produced on their farms. The relatively high percentage that believed the term "tender" applied to their grass-fed beef is consistent with what many in the industry claim to be the case – that good forage management practices lead to a tender product. Lozier et al. (2004) asked producers what keywords they used to describe their product, finding that grass-fed (and other similar terms); natural; antibiotic-free, drug-free; and hormone-free, chemical-free were the most frequently used terms. Lean and tender had fewer counts than the others.

Table 1. Responses to the question:
"Which of the following terms would apply to the grass-fed beef produced by animals on your farm?"

Term	Percentage responding indicating this term applies
Hormone-Free	97.4
Local	96.1
Natural	95.6
Antibiotic-Free	93.2
Tender	89.0
Lean	65.5

Note. Respondents could indicate that more than one of these terms apply; thus, the percentages do not sum to 100.

The most important factors in determining when to harvest and/or sell cattle were weight of the animal and consumer demand (Table 2). Following closely behind was availability of forage, which had the highest standard deviation of any of the factors considered in the survey, suggesting it was highly important for many, but not important at all for about 10% of the respondents. Age of the animal, body frame, and time of the year were in a second tier of importance, while both market price and the immediate need for cash were of much lower importance, with about 50% each responding that these reasons were not important at all in their harvest timing decisions. It is not surprising that market price would be of low importance particularly because (1) holding animals for specific lengths of time until price increases potentially moves the animal away from an optimal harvest time for meat quality and (2) few grass-fed beef animals are sold in the beef commodity market, with many producers having the opportunity to differentiate their product (set price) and sell to repeat customers. These results corroborate those found by Lozier et al. (2004), where weight was slightly more important than age, which was slightly more important than time of the year, though the differences were not great. In our case, weight of the animal was more important than the other two.

Table 2. Responses to the question:
"How important are the following factors in your decision of when to harvest or sell your cattle?"

Factor	Mean (1-4)	Standard Deviation	(1) Not Important	(2) Somewhat Important	(3) Very Important	(4) Highly Important
Weight of the animal	3.00	0.79	2.4	24.1	44.4	29.1
Consumer demand	2.99	0.89	6.5	20.4	40.1	33.0
Availability of forage	2.88	2.17	10.2	27.3	36.7	25.7
Age of the animal	2.74	0.85	6.3	33.2	40.6	19.9
Body frame	2.65	0.88	10.2	31.4	41.1	17.3
Time of the year	2.64	1.03	15.2	31.7	27.5	25.7
Market price	1.78	0.96	51.3	27.7	12.8	8.1
Immediate need for cash	1.65	0.75	48.8	40.4	7.9	2.9

Note. Outcomes expressed in percentages of importance from respondents

Table 3 provides the results of general marketing questions in the survey. Producers indicated that their grass-fed beef animals were ready for harvest/slaughter at a mean weight of 1,047 pounds, compared with 980 pounds found by Lozier et al. (2004). The standard deviation of 181 suggests relatively wide variation in the weights at which animals are harvested. About 95% of producers sold grass-fed beef as meat. Beef was sold year-round by 62% of the producers, compared with 48% of producers selling year-round in the Lozier et al. (2004) study.

Of the eight marketing channels listed in the questionnaire, a mean of approximately 2.5 were used by producers (Table 3). The standard deviation of 1.4, however, showed that a relatively large range of numbers of marketing channels was used by producers. The use of multiple marketing outlets was also found by Lozier et al. (2004). Table 4 provides percentages of surveyed producers using each of the marketing channels. Approximately 96% sold direct to consumers, likely comparable to Lozier et al.'s (2004) sale to "local individuals," 95%. Approximately 39% sold online via the internet, 36% sold via farmer's markets, and 31% sold to restaurants compared with 16% in Lozier et al.'s (2004) results. Approximately 18% sold via grocery stores compared with Lozier et al.'s (2004) finding that 28% sold via independent stores and 5% sold via chain supermarkets. Sixteen percent sold via wholesalers and/or retailers, 7% sold via cooperatives, and 4% sold via dealers, brokers, and meat packers. These results are generally consistent in ordering with those found by Mainville et al. (2009) in a telephone survey of forty-two direct marketers of beef in Virginia, but the results cannot be directly compared since their producers were not necessarily finishing their cattle on pasture.

Table 3. Descriptive statistics of selected general marketing questions

Question	Units	Median	Mean	Standard Deviation
At what live weight are your grass-fed beef animals ready for harvest / slaughter?	Pounds	1,050	1,047.2	181.4
Did you sell grass-fed beef as meat in 2012?	% "Yes"	100	95.0	-
Do you sell beef seasonally or year-round?	% Year-Round	100	61.6	-
Number of marketing channels used by producers	Number	2	2.5	1.40
Number of primary sources of information for market prices for grass-fed beef	Number	1	1.4	0.84
Number of venues through which beef is advertised	Number	2	2.6	1.13

Table 4. Responses to the question:
"Which of the following marketing channels do you use to sell your beef?"

Marketing Channel	Percentage of respondents indicating they use this channel
Direct sale to consumers	96.2
Online / Internet	38.8
Farmer's market	35.9
Restaurant	31.1
Grocery stores	18.2
Wholesalers and/or retailers	16.0
Cooperative	7.3
Dealers, brokers, or meat packers	4.3

Note. Respondents could indicate the use of more than one of the marketing channels; thus, the percentages do not sum to 100.

Of the six primary sources of information listed in the questionnaire for gaining information on market prices for grass-fed beef, the average number of sources consulted was 1.5; the standard deviation was 0.8 (Table 3). Table 5 presents the percentages using each of the six sources, with the Internet being the most heavily consulted source, at 58% usage. About 49% consulted with

other farmers for information on market prices and 19% used "other sources." An anonymous reviewer suggested that primary sources of grass-fed beef prices for some producers are farmer's markets and specialty stores. Indeed, nine producers indicated on their returned questionnaires that one of these sources was consulted for market prices, so these sources likely constitute a substantial portion of the "other" sources. Less frequently used sources included TV, radio, and magazines (10%), farm organizations (8%), and the extension service (6%).

Table 5. Responses to the question:
"What are your primary sources of information for market prices for grass-fed beef?

Source of Market Price Information	Percentage of respondents indicating they use these sources
Internet	58.0
Other Farmers	48.8
Other Sources	19.2
TV, Radio, or Magazines	9.8
Farm Organizations	8.1
Extension Service	5.7

Note. Respondents could indicate the use of more than one of the sources of information; thus, the percentages do not sum to 100.

The average number of venues through which grass-fed beef has been advertised was 2.6, with a standard deviation of 1.1 (Table 3). Table 6 shows that word-of-mouth was used by the highest percentage of producers, at 90%, followed by the Internet, 83%, and email, 47%. Lesser-used venues included newspaper / magazine and telephone (10% each), "other means," 8%, and direct mail, 7%. Radio and/or TV was used by 4% of respondents. Only 3% reported not advertising, clearly indicating the need for most grass-fed beef farms to advertise their product. These results are compared with Lozier et al. (2004), who like our study found word-of-mouth to be used by the greatest percentage of producers, followed by website, direct mail, newspaper / magazine, and others. Our greater percentage of Internet and email responses and lower percentage of direct mail and other means surely reflects the period in which the survey was conducted, with Internet and email usage much greater in 2013 than in 2001.

Table 6. Responses to the question: "How do you advertise your beef product?

Advertising Venue	Percentage of respondents indicating they advertise using this venue
Word-of-Mouth	89.7
Internet	82.7
Email	47.2
Newspaper or Magazine	10.3
Telephone	10.1
Other Means	8.1
Direct Mail	7.1
Radio and/or TV	3.8
Do Not Advertise	3.0

Note. Respondents could indicate the use of more than one method for advertising; thus, the percentages do not sum to 100.

Table 7 shows the percentages of producers selling grass-fed beef in various forms in 2012. The highest percentage of producers sold grass-fed beef as whole sides (65%), followed by

hamburger (59%), whole carcass (56%), and individual cut (54%). These are followed by quarter (47%) and mixed quarter (43%). Boxed beef was sold by only 25% and "other" was sold by 12%. These results are generally consistent with Lozier et al. (2004), who found whole side to be the most commonly reported at 74%, followed by the following in the range of 48–57%: split side or mixed quarter, hamburger, individual cut, and whole carcass. They also found boxed beef to be the least common form producers used to sell grass-fed beef.

Table 7. Farmers (95%) selling grass-fed beef as meat in 2012[1]

Form	Percentage of respondents indicating they sell grass-fed beef in these forms
Whole Side	64.6
Hamburger	59.1
Whole Carcass	56.0
Individual Cut	54.0
Quarter	46.7
Mixed Quarter	42.5
Box – Different Sized	24.9
Other	11.7

Note. [1]Respondents could indicate the sale of beef in more than one of the forms; thus, the percentages do not sum to 100.

Multivariate Probit and Poisson Regression Results

Variance inflation factors do not indicate a problem with multicollinearity among independent variables in the regression. The highest was 1.58, which is much lower than the "rule of thumb" that variance inflation factors greater than ten indicate harmful multicollinearity (Kennedy 1992, 183). For all models, Huber-White heteroskedasticity-consistent standard errors were estimated. Table 8 provides the means of variables included in the multivariate probit and Poisson regression models, unless provided in earlier tables. Tables 9 (see Appendix) and Table 10 show results of the probit and Poisson models examining marketing channel use. Producers who had been operating farms for longer periods were less likely to use the Internet to market their grass-fed beef. This result is not surprising given that those with greater experience are likely to have developed expertise in marketing via alternative marketing channels prior to extensive availability of the Internet as a marketing venue.

Farm income diversification significantly impacted marketing channel choice. Greater percentages of income from off-farm sources decreased marketing via direct sale to consumers, cooperatives, restaurants, farmer's markets, and wholesalers and retailers. Two of these marketing channels require significant transaction costs for each sale, with (1) direct sale to consumer generally requiring personal interaction with each sale and (2) the use of farmer's markets generally requiring significant effort to load and display product as well as sell individually to consumers regularly during the week. In many cases, producers selling to restaurants have developed professional relationships with restaurant personnel and deliver the product to those restaurants on a regular basis. Formation and maintenance of cooperatives can also require significant effort on the part of member producers. For these reasons, it is not surprising that producers with greater percentages of income from off-farm sources would be less likely to utilize marketing channels that require relatively high transaction costs. The Poisson regression estimates show that producers with greater percentages of household income

from off-farm sources use fewer marketing channels for their grass-fed beef; with each additional 20% of household income from off-farm sources, the number of marketing channels used decreased by 0.19.

Table 8. Descriptive statistics of the independent variables included in the multivariate probit and Poisson regression models

Variable	Definition	Median	Mean	Standard Deviation
Years Operated	Number	10	1.32	8.05
% Income Off-Farm	1: 0-19%; 2: 20-39%; 3: 40-59%; 4: 60-79%; 5: 80-100%	4	3.36	1.57
% Farm Income GFB	1: 0-19%; 2: 20-39%; 3: 40-59%; 4: 60-79%; 5: 80-100%	3	2.87	1.64
Animals Raised to Slaughter	Number	16	40.00	127.13
Total Acres	Number Divided by 1,000	0.23	1.54	9.15
Cow-Calf	Portion Including the Cow-Calf Segment	1	0.80	0.40
Certified Organic	Portion Producing Certified Organic Beef	0	0.10	0.30
Northeast	Portion in Northeast Region	0	0.21	0.41
Midwest	Portion in Midwest Region	0	0.27	0.44
South	Portion in South Region	0	0.17	0.38
West	Portion in West Region	0	0.22	0.41
Pacific	Portion in Pacific Region	0	0.14	0.35

Greater percentages of farm income from the grass-fed beef enterprise increased the use of restaurants and grocery stores as marketing channels for grass-fed beef. This variable, like the percentage of household income from off-farm sources, provides a measure of the importance of income diversification on marketing channel choice. Both of these marketing channels generally involve significant effort in developing relationships with sellers. In both cases, delivery is likely on occasional, if not regular, bases and maintenance of strong relationships with restaurant and store managers are of importance. Thus, it is unsurprising that greater use of these venues would occur when the grass-fed beef enterprise is of greater relative economic importance to the producer. Furthermore, a greater percentage of farm income from the grass-fed beef enterprise increased the number of marketing channels used by grass-fed beef producers, with an additional 20% of farm income from grass-fed beef resulting in the use of 0.16 additional marketing channels.

Table 10. Poisson regression analysis results with dependent variable, number of marketing outlets used[1,2]

Variable	Estimate	Marginal Effect
Constant	1.0300***	
	(0.1184)	
Years operated	-0.0024	
	(0.0044)	
% Income off-farm	-0.0734***	-0.1894***
	(0.0221)	(0.0567)
% Farm income GFB	0.0604***	0.1558***
	(0.0203)	(0.0522)
Animals raised to slaughter	0.0006**	0.0017***
	(0.0003)	(0.0007)
Total acres	0.0222***	0.0572***
	(0.0053)	(0.0134)
Cow-calf	-0.1135	
	(0.0767)	
Certified organic	-0.0598	
	(0.1355)	
Northeast	0.1860**	0.5072*
	(0.0875)	(0.2520)
South	0.1795*	0.4931
	(0.1031)	(0.3027)
West	0.0307	
	(0.0987)	
Pacific	-0.0460	
	(0.1132)	
Observations	336	
Prob > χ^2	0.000	
Pseudo R^2	0.0338	

Note. [1]Symbols ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels, respectively. [2]Numbers in parenthesis are robust standard errors.

Farm size was included using two variables, number of animals raised to slaughter and total farm acres. Producers raising more animals to slaughter weight were less likely to market beef direct-to-consumer and more likely to market via restaurants, grocery stores, and wholesalers / retailers. Volume is often of importance when supplying retailers or restaurants, as opposed to selling direct-to-consumer, where product is commonly sold in small volume and transaction costs per unit sold are relatively high. A greater number of total acres operated increased the probability of selling via dealers, brokers, or meat packers. Increases in both numbers of animals raised to slaughter weight and acres operated increased the total number of marketing channels used, suggesting that larger-scale producers were more likely to market via greater numbers of marketing channels. Certified organic producers were less likely to market via farmer's markets. Region was of importance in marketing channel choice. Relative to midwestern producers, northeastern producers were less likely to market via cooperatives and more likely to market via restaurants, grocery stores, and dealers, brokers, or meat packers. Northeastern producers also marketed via a greater number of marketing channels than midwestern producers. Southern producers were more likely to market via dealers, brokers, or meat packers and marketed via a greater number of marketing channels than midwestern producers. Finally, *Pacific* producers

were more likely to market via the Internet and less likely to market via restaurants and farmer's markets than midwestern producers.

Conclusions

Limited work has addressed the nature of farmer grass-fed beef marketing in the United States. This research addresses the what, where, and how of grass-fed beef marketing. With rapidly growing consumer interest in grass-fed beef, our observations have been that grocery store and restaurant managers are increasingly searching for sources of grass-fed beef and some producers are open to entering into alternative business arrangements (such as strategic alliances) for extending the market for their product. Knowledge of how grass-fed beef is currently marketed and the beef cuts currently being offered provides agricultural businesses with valuable information on the current grass-fed beef market. Furthermore, this knowledge allows post-farm gate agricultural businesses and current and prospective grass-fed beef producers to consider steps they might consider for improving markets for this product.

Our results are valid to the extent that we were able to find addresses for a representative sample of US grass-fed beef producers and that the respondents were a representative sample of those for whom we had addresses. Because of the nature of the grass-fed beef industry (few established markets with most producers developing their own markets), most producers likely have an Internet presence for marketing purposes, so we believe we have identified a good sample of producers.

Our results suggest that the vast majority of grass-fed beef farmers believe they can advertise their product as hormone-free, local, natural, antibiotic-free, and tender, and a majority would be able to advertise it as lean. Furthermore, farmers rank an animal attribute (weight) and consumer demand as the two most important factors in determining when to harvest/sell their animals rather than factors such as market price and immediate need for cash. Stressing animal attributes and consumer demand as important will lead to faster development of this segment of the beef industry as a more consistent quality product is provided to the consumer, encouraging repeat buyers.

By far the most frequently reported marketing channel was direct sale to consumers. This does not mean that this marketing channel accounted for the greatest volume, only that it was used by the highest percentage of producers. Potential benefits that make direct sale a desirable channel to market grass-fed beef include price premiums received and the ability to retain loyal customers. Direct sale was followed by Internet, farmer's market, and restaurant marketing, each in the 31–39% range of use. A third tier of use was grocery stores and wholesalers/retailers. Finally, cooperatives and dealers, brokers, or meat packers were the least likely to be reported as being used.

The Internet was the most heavily consulted source of information for market prices for grass-fed beef. The USDA now publishes a national monthly grass-fed beef price report on its website, so the Internet is likely increasingly a source of information for grass-fed beef pricing. Wholesale and direct marketed beef are quoted on a per pound basis whereas dressed carcass is quoted per hundred pounds. Word-of-mouth was the most popular mode for advertising grass-fed beef. This

shows potential for improving grass-fed beef sales by using low-cost advertising means such as free Internet sites and email.

Probit and Poisson regression results show a number of farm and farmer characteristics as drivers of marketing channel use. Higher transaction costs associated with direct marketing reduces its use by larger producers and those with higher percentages of off-farm income. Furthermore, those with higher percentages of off-farm income are lower users of farmer's markets, likely due to the higher transaction costs. Those marketing via restaurants and grocery stores tend to be larger-scale and more specialized in grass-fed beef production. Overall, farm size and diversification tended to be the major drivers of marketing channel choice, with those more specialized in grass-fed beef and larger-scale tending to use the largest numbers of marketing channels.

As the market for grass-fed beef continues to expand, many of the larger-scale grocery stores and restaurants with interest in carrying grass-fed beef products are likely to desire to purchase it in larger quantities than most grass-fed beef producers working alone can provide. This will likely lead to increased interest in unique strategic alliance arrangements, where producers market their product together with other producers, perhaps sharing common processing and distribution systems.Whether such alliances are organized as cooperatives, formal contracts, or through "looser" verbal agreements will depend upon the preferences of the firms involved. With the current marketing structure, however, that includes extensive direct selling of the product by the producer, we expect significant industry structural change in response to the increased demand. We believe that further research on strategic alliances that would facilitate the development of new markets for grass-fed beef would be helpful to the industry.

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Appendix

Table 9. Multivariate probit results for each marketing channel, grass-fed beef producers[1,2]

Variable	Direct Sale to Consumers	Online / Internet	Cooperative	Restaurants	Grocery Stores	Farmer's Market	Wholesalers and/or Retailers	Dealers, Brokers, or Meat Packers
Constant	2.9270***	-0.0472	-0.8242*	-0.3706	-1.5990***	0.2006	-1.2707***	-2.5986***
	(0.5603)	(0.2726)	(0.4352)	(0.2702)	(0.3438)	(0.2839)	(0.3442)	(0.4906)
Years Operated	0.0141	-0.0241**	0.0014	-0.0068	-0.0058	-0.0069	0.0173	0.0044
	(0.0197)	(0.0105)	(0.0124)	(0.0109)	(0.0105)	(0.0102)	(0.0112)	(0.0156)
% Income Off-Farm	-0.1737**	-0.0015	-0.1962***	-0.1291***	-0.0605	-0.1688***	-0.1279**	0.0356
	(0.0815)	(0.0463)	(0.0670)	(0.0496)	(0.0579)	(0.0488)	(0.0565)	(0.0857)
% Farm Income GFB	-0.0408	0.0033	0.1067	0.0836*	0.1132**	0.0371	0.0476	0.1159
	(0.0776)	(0.0443)	(0.0721)	(0.0497)	(0.0559)	(0.0466)	(0.0543)	(0.0755)
Animals Raised to Slaughter	-0.0019***	-0.0001	-0.0005	0.0068***	0.0075***	0.0010	0.0065***	-0.0005
	(0.0004)	(0.0006)	(0.0017)	(0.0022)	(0.0021)	(0.0008)	(0.0019)	(0.0016)
Total Acres	0.0179	0.0242	-0.0509	0.0111	0.0442	0.0022	0.0210	0.0865***
	(0.0277)	(0.0337)	(0.0597)	(0.0199)	(0.0287)	(0.0240)	(0.0268)	(0.0181)
Cow-Calf	-0.4347	-0.1617	-0.3439	-0.1857	0.1003	-0.0793	-0.0771	-0.0061
	(0.3766)	(0.1740)	(0.2256)	(0.1878)	(0.2238)	(0.1754)	(0.2230)	(0.3121)
Certified Organic	-0.0125	-0.1182	0.2093	0.0773	0.0319	-0.7034**	0.0185	-0.0094
	(0.4539)	(0.2732)	(0.3346)	(0.2598)	(0.3270)	(0.3281)	(0.2686)	(0.3990)
Northeast	0.0735	-0.0145	-0.5046*	0.4735**	0.4319*	0.2677	0.1873	0.5144*
	(0.3866)	(0.2102)	(0.2939)	(0.2137)	(0.2591)	(0.2079)	(0.2639)	(0.3093)
South	-0.1180	-0.1177	0.0559	0.2021	0.2921	0.2794	0.4098	0.7396**
	(0.3978)	(0.2295)	(0.2965)	(0.2298)	(0.2733)	(0.2277)	(0.2747)	(0.3384)
West	-0.2463	0.1898	0.0686	-0.2001	0.1876	0.0701	-0.2117	-0.0542
	(0.3374)	(0.2157)	(0.2947)	(0.2339)	(0.2724)	(0.2094)	(0.2777)	(0.3208)
Pacific	0.1055	0.7995***	-0.2951	-0.7487**	-0.2821	-0.7436**	0.0154	-0.0594
	(0.4717)	(0.2412)	(0.3989)	(0.3237)	(0.3089)	(0.3010)	(0.2604)	(0.5608)

[1]Symbols ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels, respectively.
[2]Numbers in parenthesis are robust standard errors.

