

Article

Growth and Development in the U.S. Retail Organic Food Sector

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Abstract: This study uses retail purchase data reported by the Nielsen Homescan panel to examine the development of selected U.S. organic food sectors since the implementation of the National Organic Standards. Results show that organic market shares within the fresh fruit and vegetable sectors grew slightly in 2003–2006. Apples, bananas, carrots, and tomatoes prove to have the highest share of organic sales within their sectors. The share of organic milk sales attributed to private labels has increased from 12 to 32 percent in 2004–2007. The organic market share within the strained baby food sector almost doubled from 8 to 15 percent in 2004–2007. Findings show a demographically diverse group of consumers willing to expend their food dollars on organic foods.

Keywords: national organic standards; Nielsen Homescan; fresh fruits and vegetables; produce; milk; baby foods

1. Introduction

With a growing world population and demand for food, interests in an enduring and diverse agricultural system have been ever increasing in recent years. Sustainable agriculture offers many environmental benefits through its management practices that enhance biodiversity, as well as maintaining a natural ecological harmony. 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

resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls; sustain the economic viability of farm operations; and enhance the quality of life for farmers and society as a whole” [1]. Presently, there lacks a ‘sustainable’ label for food products in the U.S. However, through the organic label one can track consumer and producer interests in organic agriculture—a food production system that is in accordance with sustainable agricultural values.

Organic products are considered credence goods—consumers do not know that the product is organic unless they are told so [2]. To clear confusion in the U.S. marketplace and reduce mislabeling of organic products, both consumers and producers insisted on a national standard. Thus, the U.S. Congress passed the Organic Foods Protection Act of 1990 as part of the 1990 Farm Bill to establish a national standard for organically produced products and to guarantee consumers that these products consistently meet the standards. In October 2002 under the National Organic Program, a certification process was implemented, thereby labeling the product as to adhering to the law. The certification process insures that a product with the U.S. Department of Agriculture (USDA) organic label, or any other organic certification claim, is in fact organically produced and handled. According to USDA regulations, organic production is defined as “a production system that is managed in accordance with the [Organic Foods Production] Act and regulations in this part to respond to site-specific conditions by integrating cultural, biological and mechanical practices that foster cycling of resources, promote ecological balance and conserve biodiversity” [3].

Since the implementation of the USDA organic regulations in October of 2002, the market for organic foods has continued to grow rapidly as they have become increasingly accepted by consumers and available in mainstream retail outlets. According to industry reports by the *Nutrition Business Journal (NBJ)* [4], sales in the 2007 U.S. organic food sector have grown from \$10.4 billion to \$18.9 billion over 2003-2007 reaching 3.3 percent of the U.S. food markets (excluding food service). Among the organic food categories, fruits and vegetables by far comprise the largest retail sales (\$6.9 billion), accounting for 37 percent of total sales in 2007 followed by dairy (\$3.1 billion) representing 16 percent. While the two market giants in the organic marketplace, produce and dairy, garnered over half of the reported retail organic sales in 2007, the organic baby food sector held a modest 1.4 percent of the market [4]. In comparison to organic produce and dairy, which made up 6.6 and 5.1 percent of their respective total market sales in 2007, organic baby food constitutes an astounding 7.3 percent of sales in the baby food market according to *NBJ* [4].

The importance of fruits and vegetables in the organic food market is also reflected in the production statistics, showing that only 0.2 percent of U.S. corn and soybean acreage was certified organic in 2005, compared with 2.5 percent of fruits and 5 percent of vegetables [5]. Organic milk is an important player in the organic arena as it is one of the first organic foods consumers try [6]. Fifty-two percent of organic dairy sales are attributed to milk and cream, which constituted just over 8 percent (\$1.6 billion) of the U.S. organic food and beverage market as a whole in 2007 [4]. While trends in the organic food market have been reported for major food groups (e.g., produce, dairy, and baby food), there exists a void in some detail descriptions of specific foods within each group (e.g., distribution of individual fruits and vegetables) as well as consumer spending across important household characteristics.

Previous studies conducted by the authors on the aforementioned commodities largely focused on premium structures by estimating hedonic price equations [7-9] and investigating the correlation

between organic user group membership and consumer characteristics through regression models [10]. The objective of this study is to describe the U.S. retail organic food sector in more detail, focusing on fresh fruits and vegetables, as well as fluid milk and strained baby food, by analyzing market make-up and investigating purchasing patterns across key consumer demographics. The following section introduces our data and the subsequent section reports detailed information about the aforementioned sectors. Finally, we discuss what new insights can be gained from such an analysis.

2. Nielsen Homescan Data

The data source of this study is the Nielsen Homescan panel. The panel is a stratified random sample targeted to be representative of the U.S. population that provides food purchase data for at-home consumption. Homescan includes actual retail purchases spanning many types of outlets (e.g., supermarkets, grocery, club/warehouse and convenience stores) from a large demographically diverse panel. Linked to each panelist are key household characteristics, such as income, education, and race/ethnicity, as well as many other demographics. Each household is supplied with a scanner device that the panelist uses at home to record grocery items purchased at all retail outlets. Each purchase records the quantity purchased, expenditure for that quantity, promotional information, and detailed product characteristics. For UPC (Universal Product Code)-coded (or packaged) food products, organic items can be identified by the presence of the USDA organic seal or with organic-claim codes created by Nielsen. For random-weight (or non-packaged) food items, Nielsen uses a coding system, which identifies organic foods. The price paid for each purchase is derived as the ratio of reported expenditures, net of any promotions, to the corresponding quantity.

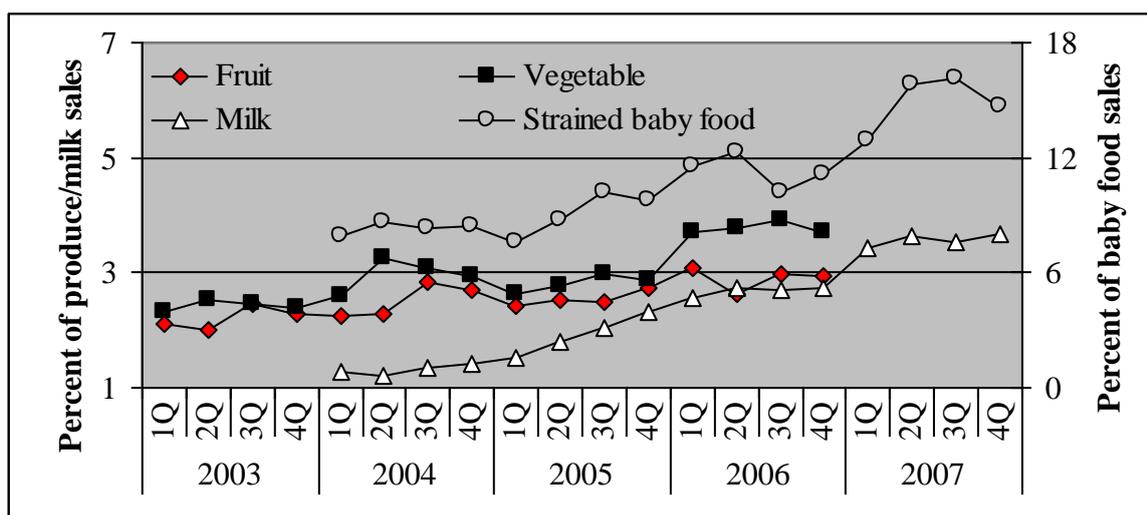
This study uses two versions of Nielsen's Homescan panel. The larger data set consists of over 37,000 households that record all UPC-coded food purchases, which we call the "UPC Panel". A subset of these households (over 7,500 panelists) records purchases of both UPC-coded foods and random-weight (non UPC-coded) foods, such as loose fruits and vegetables, called the "Fresh Foods Panel". The UPC Panel is useful for examining packaged foods (as in the case of organic baby food and milk), whereas the Fresh Foods Panel is more useful for examining purchases of perishable 'deli-style' foods (as in the case of organic fresh fruits and vegetables). Projection weights provided by Nielsen for each household allow each panel to reflect the demographic distribution within the strata. For fresh fruits and vegetables, we consider the four year period from 2003 to 2006, as these are the years in which the Fresh Foods Panel is available. For fluid milk and strained baby food, we investigate the four year period from 2004 to 2007, in which the larger UPC Panel is available.

3. The U.S. Retail Organic Food Sector

Sales of organic food in 2008 have grown to approximately 3.5 percent of food products sold in the U.S. However, it is interesting to note that there are disparities in growth patterns between each type of food. To illustrate the increasing amount of dollars being spent on organic within each sector, quarterly organic sales dollars as a percent of total sales within each sector are presented in Figure 1. As shown in Figure 1, the organic sector accounted for 2.18 and 2.41 percent of fresh fruit and vegetable sales in 2003, respectively, and the shares grew to 2.79 and 3.67 percent in 2006. Fruits and vegetables have followed a similar path due to their closely related production and marketing techniques. On the other

hand, milk has shown a much more noticeable increase in sales over the four year time period. Sales of organic milk have grown steadily from 1.31 percent of annual milk sales in 2004 and reaching 3.57 percent in 2007. Although organic produce and milk have traditionally made up the majority of organic retail sales, organic baby food has shown a strong stake within its own sector. Notably, the strained baby food sector (excludes formulas, teething biscuits, juices, and cereals) has shown strong organic sales figures amounting to 8.29 percent of the sector in 2004 and a staggering 14.78 percent in 2007.

Figure 1. Quarterly organic market shares computed as a percent of sales.



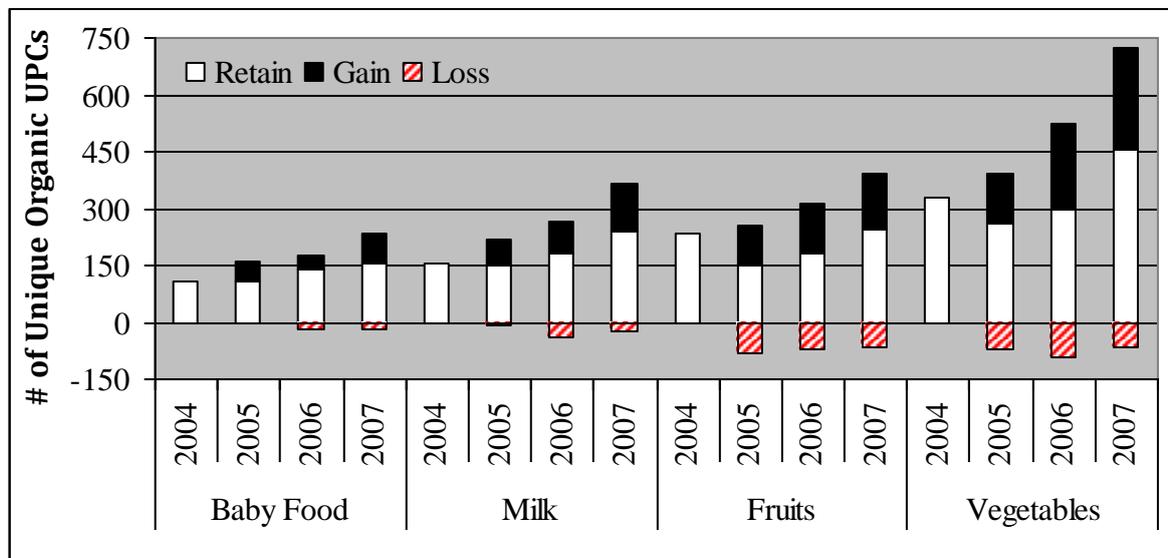
Source: Compiled from Nielsen's Homescan Panel (Fresh Foods, 2003-2006 and UPC, 2004-2007).

In addition to sales dollars coming from consumers' pockets, it is of interest to examine how suppliers have reacted to the increased demand. One way of tracking suppliers' interest in the organic market is through their packaged product offering in each of the four sectors. Each packaged organic product can be uniquely distinguished by its Universal Product Code (UPC) in the UPC panel for the years 2004-2007. Information related to changes in the packaged organic products purchased in the marketplace for the four food sectors is present in Figure 2. A product is considered retained in the market (white bars) when it has an observed purchase record in the current year and in the previous year. Note that 2004 is used as the base year which shows only the total number of unique UPCs purchased. A gain in product offering in the marketplace (black bars) is distinguished by a purchase in the current year in which no corresponding purchase record was observed in the previous year. Thus white plus black bars represent the total number of unique UPCs purchased in each year. We identify a loss in product offering (red striped bars) by a purchase record in the previous year, but no subsequent observation in the present year.

As shown in Figure 2, the number of organic products retained in the market, as well as the total number of new organic products (black bars) introduced, has been increasing except for baby foods' gains in 2006. It is no surprise that fruits and vegetables have registered the largest shares of organic UPCs each year given that it represents for 37 percent of the organic foods market. The growth pattern depicted in Figure 2 signifies the healthy development of food products within the organic market's

major sectors as suppliers react to an increasing demand for organic foods. In the following subsections, we investigate each food sector in more detail.

Figure 2. Number of UPC-coded organic foods introduced and retained in the market.



Source: Compiled from Nielsen’s Homescan Panel (UPC), 2004–2007 (random-weight organic fresh fruits and vegetables excluded).

3.1. Organic Fresh Fruit Sector

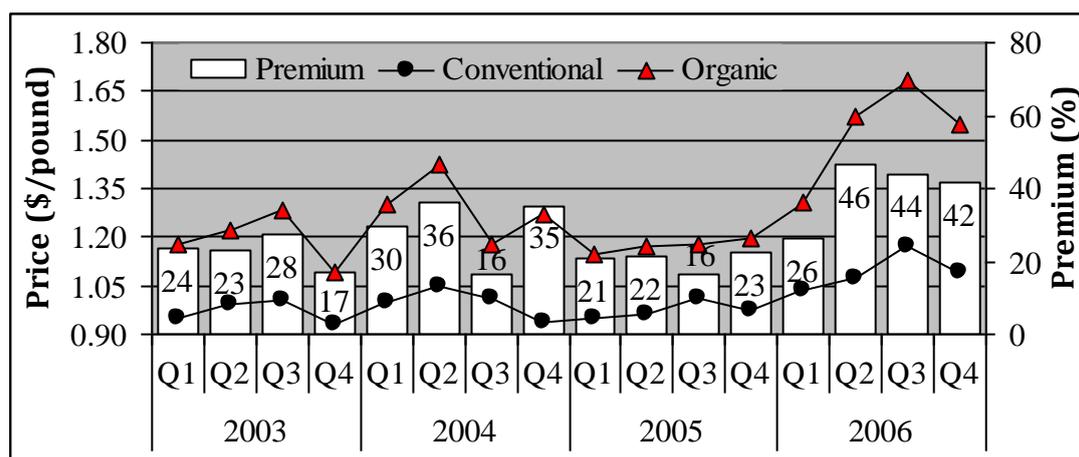
The popular press and trade literature clearly indicate fresh produce as the dominant sector within the organic market over the past decade [4,11]. However, as to which fruit or vegetable holds the greatest weight within their respective sectors is not clearly defined. The distribution of organic sales by individual fresh fruits in Table 1 clearly shows apples as the market leader over the four year period, extending its prominence to almost 27 percent of organic fruit sales in 2006, followed by bananas, strawberries, grapes, and oranges. All other organic fruits each represent less than 5 percent of the share of organic fruit sales. During 2003–2006, apples and strawberries grew in their shares, while grapes saw the biggest drop, followed by oranges. However, it is important to note that a gain or loss in share among each fruit doesn’t necessarily represent an increase or decrease in total retail sales, but rather a shift in distribution of sales within the sector. An individual fruit’s intra-market penetration, measured by the ratio of organic to conventional quantity purchased, can be used as a measure of growth within its own market. For example, bananas hovered around 14.5 to 16.5 percent of organic fruit sales yet have shown a steady increase in their intra-market penetration from just over 2 percent of the banana market in 2003 and 2004 to around 2.25 percent in 2005 and 2006.

Table 1. Distribution of organic fresh fruit sales.

Fruits	Share of organic fresh fruit sales (%)			
	2003	2004	2005	2006
Apples	17.80	15.27	17.85	26.82
Bananas	16.60	14.49	16.53	15.24
Strawberries	5.47	6.19	6.96	6.98
Grapes	11.94	10.27	8.34	6.50
Oranges	8.11	7.82	7.31	5.41
Pears	4.10	3.98	4.85	4.68
Blueberries	0.79	1.27	2.47	4.00
Watermelons	3.30	4.46	2.83	3.47
Avocados	2.33	4.12	3.38	3.29
Kiwis	0.92	1.21	1.83	2.81
Other fruits	28.64	30.92	27.65	20.80

Source: Compiled from Nielsen's Homescan Panel (Fresh Foods), 2003–2006.

One factor that may contribute to the development of each fruit's market share is the organic premium consumers must pay. As an example, we present the average seasonal price paid for conventional and organic fresh apples in Figure 3 over 2003–2006. One can see that the organic premium in 2005 ranged from 16 to 23 percent, whereas in 2006 the range increased to 26 to 46 percent. Prior to 2006, the price spread between organic and conventional apples appears fairly constant. However, the organic premium began to widen increasingly after 2005. The notable increasing in organic premium in 2006 may reflect a market condition that demand for organic apples has outpaced the supply. In addition, we calculate that the organic intra-market penetration was 2.15 percent in 2005 within the apple market and rose to 3.25 percent in 2006, implying that an increase in organic intra-market penetration coupled with a higher premium could be what drove apples to account for over a quarter of total organic fruit sales in 2006.

Figure 3. Average seasonal price of fresh organic and conventional apples, 2003–2006.

Source: Compiled from Nielsen's Homescan Panel (Fresh Foods), 2003–2006.

Aside from looking at organic market shares and price premiums, we also examine the share of organic fresh fruit spending by specific consumer segments. Specifically, we analyze the proportion of dollars spent on organic by race/ethnicity, income, and education. As shown in Table 2, the average American spent 2.2 percent of their at-home fresh fruit dollars on organic in 2003, and that number increased to 2.8 percent by 2006. Compared to the rest of the population, non-Caucasians spent relatively more on organic fresh fruits since the implementation of the National Organic Standards, with the exception of Asian-Americans in 2006. Hispanic-Americans represent a small, but fast-growing demographic in the United States and have spent proportionally more on organic fruits than any other race/ethnicity during the time period investigated. However, much of the growth in the at-home organic fresh fruit sector in the U.S. could be attributed to the white population, as they represent by far the largest ethnic group and have shown a steady increase in spending from 1.7 to 2.4 percent during 2003–2006.

Table 2. Share of fresh fruit expenditures spent on organic.

Demographic	Organic share of spending (%)			
	2003	2004	2005	2006
Total U.S. population	2.18	2.41	2.48	2.79
Race/ethnicity				
White	1.67	2.03	1.92	2.39
Black	3.52	3.46	3.17	4.18
Hispanic	4.26	4.13	5.42	4.57
Asian	3.55	2.59	2.54	1.50
Other	2.62	1.78	1.97	2.13
Income (\$1,000)				
< 25	3.06	3.13	3.35	3.02
25–34.9	2.53	1.80	2.13	2.89
35–44.9	1.25	2.36	2.62	2.05
45–59.9	1.78	2.66	1.62	2.68
60–99.9	2.05	1.98	1.95	2.66
100 +	1.97	2.25	3.36	3.28
Education				
High school or less	2.13	2.67	2.70	2.22
Some college	1.81	1.78	1.69	2.55
College and beyond	2.54	2.78	3.04	3.36

Source: Compiled from Nielsen's Homescan Panel (Fresh Foods), 2003–2006.

With regards to income, it is interesting to see that the lowest income group (under \$25,000/year) expends the highest percentage of their fresh fruit dollar on organic than the remainder of the population, with the exception of the highest earners (\$100,000 plus) in 2005 and 2006. A popular perception in the organic trade circle is that income doesn't necessarily track organic sales [11,12]. However, some empirical studies have found that higher income households are more likely to purchase

organic produce [13,14] and become ‘loyal’ organic consumers [10], while others have found no correlation with organic purchase behavior and income [15,16]. Unlike the previous three years, in 2006 there appears to be a clear association between educational attainment and spending on organic fresh fruits. Households with at least some college education increased their relative spending on organic during 2005–2006, while those with a high school diploma or less showed a decrease. Overall, the Homescan purchase records show a consistent steadily increase in organic fresh fruit spending among households with the highest level of educational attainment.

3.2. Organic Fresh Vegetable Sector

Contrary to organic fruits, the organic vegetable sector has seen its traditional market leader tomatoes retreat to the number two spot in 2006, replaced by carrots. Carrots doubled its share of organic vegetable sales between 2003 and 2006 from 12 to almost 25 percent (Table 3). Tomatoes had a share of almost 22 percent of the organic vegetable market in 2003, but saw its share steadily decline to 16 percent in 2006. The decline in market share for organic tomatoes is due to its relatively stable intra-market penetration into the fresh tomato market over 2003–2006 (just over 3 percent) coupled with proportionally larger growth of other vegetables, most notably carrots and spinach. Spinach has seen its share of fresh organic vegetable sales more than double from 2.2 percent in 2003 to 5.9 percent in 2006; both carrots and spinach can attribute most of their growth to comparatively large sales volumes in 2006 over previous years. The organic intra-market penetration for carrots and spinach, measured by the ratio of organic to conventional quantity purchased, was calculated at 4.72 and 5.83 percent in 2005, respectively, and rose substantially to 11.09 and 8.39 percent in 2006. Lettuce and potatoes have also been emerging as strong organic players in the vegetable arena. All other vegetables had less than 5 percent of the sector in 2006.

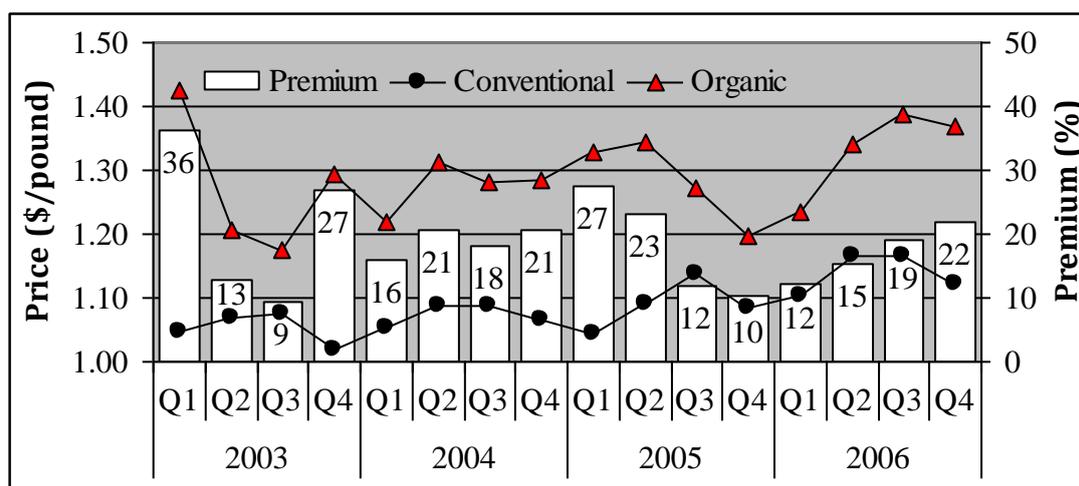
Table 3. Distribution of organic fresh vegetable sales.

Vegetables	Share of organic fresh vegetable sales (%)			
	2003	2004	2005	2006
Carrots	12.12	10.64	14.92	24.89
Tomatoes	21.94	21.70	19.90	16.05
Lettuce	9.17	9.34	10.29	10.05
Spinach	2.20	2.71	4.08	5.91
Potatoes	4.27	6.02	5.28	5.43
Onions	5.81	5.44	6.44	4.94
Yams	3.11	2.46	3.40	3.89
Peppers	3.60	4.16	3.91	3.54
Celery	2.28	2.30	3.07	2.65
Mushrooms	2.33	3.06	1.96	2.54
Other vegetables	33.18	32.18	26.73	20.13

Source: Compiled from Nielsen’s Homescan Panel (Fresh Foods), 2003–2006.

The price of conventional carrots followed a seasonal path similar to apples—increasing through the first three quarters of each year and then declining in the fourth. Like organic apples, organic carrots followed a similar trend of their conventional counterparts and have shown an increase in price, as well as premium, through most of 2006. Organic price premiums for carrots in 2003–2004 varied widely from 9 to 36 percent, while we calculate organic tomato premiums during the same time period at 6 to 20 percent. However, carrot premiums since the third quarter of 2005 have remained under 23 percent, although increasing, whereas tomato premiums jumped to the 24 to 26 percent range throughout 2006. It appears the relatively low premium for organic carrots in 2006 was a driving factor in its ability to capture just over 11 percent of the carrot market, and ultimately almost 25 percent of the sector.

Figure 4. Average seasonal price of fresh organic and conventional carrots, 2003–2006.



Source: Compiled from Nielsen's Homescan Panel (Fresh Foods), 2003-2006.

With respect to organic spending across the three demographic characteristics, Table 4 shows that the average American increased their share of spending on organic from 2.4 to 3.7 percent of each at-home fresh vegetable dollar over 2003–2006. As with fresh fruits, non-Caucasian races/ethnicities tend to spend a proportionally higher percentage of their fresh vegetable dollar on organic. It is interesting to note that Black households' spending on organic fresh fruits and vegetables has fluctuated over the years; their organic shares for fruits and vegetables remain about the same in 2006. The Asian-American population has considerably decreased their relative spending on organic fresh vegetables from 6.1 to 2.9 percent over 2003–2006, while Hispanics have doubled their share from 2.9 to 6.1 percent. The observation that the non-Caucasian population, except for Asian-American, has a propensity to spend more of their fresh produce dollar on organic is similar to findings in the literature [5,10,13,14]. It is a puzzling trend and a surprise to find out that Asian-American households have consistently reduced more than 50 percent of their spending on organic fresh produce from 2003 to 2006.

Similar to fruits, there appears to be a bimodal relationship between income and the share of spending on organic vegetables. At both the lowest (less than \$25,000/year) and highest (\$100,000/year or more) levels of income, the ratio of organic to conventional spending is generally at its highest, and

these income groups expend a higher share of their vegetable dollar on organic than the average American (Table 4). Economic studies investigating consumption of and propensity to spend on organic produce in relation to income have found mixed results [10,13,14] possibly due to such findings presented here. Increased educational attainment is once more associated with a higher share of fresh vegetables dollars spent on organic.

Table 4. Share of fresh vegetable expenditures spent on organic.

Demographic	Organic share of spending (%)			
	2003	2004	2005	2006
Total U.S. population	2.41	2.82	2.70	3.67
Race/ethnicity				
White	1.98	2.57	2.29	3.33
Black	4.41	4.06	3.41	4.18
Hispanic	2.91	3.26	4.51	6.09
Asian	6.13	3.73	3.70	2.91
Other	3.51	3.79	3.11	2.71
Income (\$1,000)				
< 25	2.57	3.13	2.79	3.72
25–34.9	2.82	2.10	2.77	4.28
35–44.9	2.06	2.52	3.04	2.29
45–59.9	2.17	3.14	1.87	2.44
60–99.9	2.28	2.74	2.61	3.98
100 +	2.66	3.24	3.32	4.67
Education				
High school or less	1.80	2.36	2.22	2.27
Some college	2.22	2.40	2.11	3.62
College and beyond	3.09	3.52	3.53	4.82

Source: Compiled from Nielsen's Homescan Panel (Fresh Foods), 2003–2006.

3.3. Organic Fluid Milk Sector

According to the *NBJ* [4], fifty-two percent of organic dairy sales are attributed to milk and cream constituting just over 8 percent (\$1.6 billion) of the U.S. organic food and beverage market in 2007. In addition, sales of private label organic products increased 79 percent over the year ending July 14, 2007, as compared to just 18.5 percent for branded items [4]. Branding has played an important role in retail milk sales for the past few decades, and organic milk is becoming no exception. As shown in Table 5, the percent of purchases attributed to private label milk has been increasing at much faster rate for organic over conventional in all four U.S. census regions. For example, organic private label sales in the Northeast were just below 2 percent of all organic milk purchases in 2004, but reached almost 30 percent by 2007. On the other hand, the Western states appear to be early adopters of purchasing organic private label milk. However, as the market evolved over the four year period, all four regions

have converged to the 28 to 38 percent range. Our results show that the share of private label in conventional milk sales has been relatively stable, increasing about 6 percent nationwide from 2004 to 2007, while the share of organic milk sales has increased almost 160 percent. In 2007, 32 percent of all U.S. organic milk purchases came from a private label as compared to 69 percent of conventional milk purchases. The increasing popularity of private label among organic milk consumers could possibly be attributed to the fact that consumers may have become less inclined to view private labels as inferior products to their branded counterparts.

Table 5. Percent of organic fluid milk purchases contrast conventional purchases with respect to container size, fat content, and branding.

Characteristic	Organic purchases (%)				Conventional purchases (%)			
	2004	2005	2006	2007	2004	2005	2006	2007
Private label								
Northeast	1.70	14.66	20.04	29.33	50.32	51.99	54.46	56.88
Central	6.85	22.25	21.12	28.04	57.29	58.52	59.46	62.69
South	9.79	15.48	27.79	30.98	73.77	72.81	73.43	74.19
West	25.25	32.01	32.61	38.18	73.85	76.13	75.73	78.39
National	12.45	21.78	26.62	32.32	65.54	66.33	67.10	69.28
Container size								
Pint	0.12	0.31	0.11	0.08	1.12	1.18	1.15	1.15
Quart	2.12	1.89	1.78	1.13	6.52	5.97	5.85	5.59
Half gallon	91.26	90.78	87.78	86.32	31.44	31.59	31.26	29.71
Gallon	6.51	7.02	10.34	12.47	60.93	61.26	61.73	63.55
Fat content								
Non-fat/skim	30.42	30.15	29.98	27.03	22.89	23.43	23.83	22.32
Low-fat	45.20	45.54	48.13	46.68	53.04	53.12	53.84	52.62
Whole	24.37	24.31	21.89	25.56	23.95	23.34	22.28	23.93

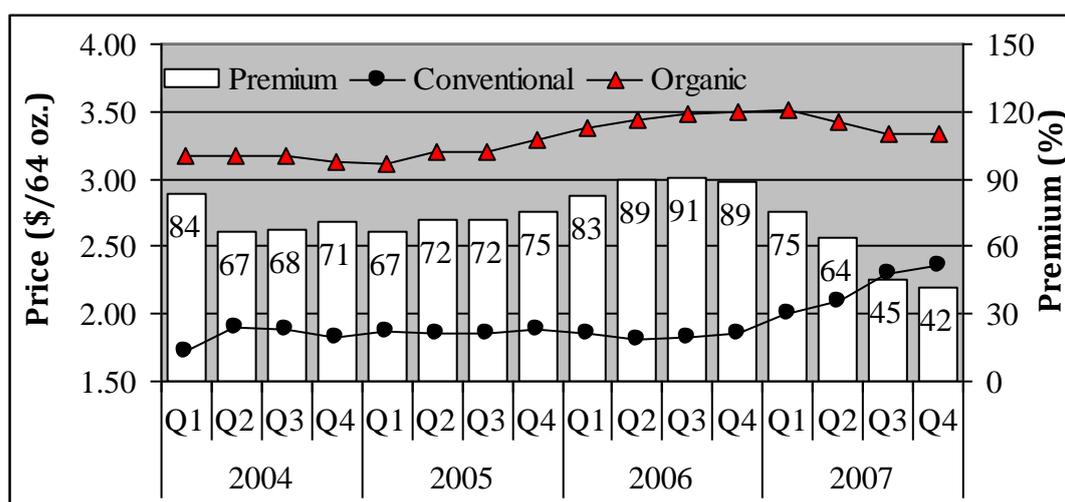
Source: Compiled from Nielsen's Homescan Panel (UPC), 2004–2007.

Other than branding, there are other notable differences that characterize consumers' purchases of organic and conventional milk. The distribution of organic and conventional milk purchases also vary by container size and fat content (Table 5). Milk purchased in half gallon containers dominates the organic market, whereas gallon containers are the preferred choice for conventional milk consumers. In 2004, over 91 percent of organic milk was bought in half gallons, which decreased to just over 86 percent by 2007 (Table 5). The decline in the percent of organic half gallon purchases is most likely due to an increase of organic gallon purchases—almost doubling its organic share of purchases from 6.5 to 12.5 percent over 2004–2007. Organic pints are negligible, not even reaching one-half percent of organic purchases, while conventional pints made up just over one percent of purchases in all four years. Organic milk purchases by brand and container size appear to be trending towards the distribution of the conventional purchases, possibly signaling an evolving organic milk market into the 'mainstream' as producers cater to a broader consumer base incorporating organic milk into their food basket.

Differences in fat content are not as apparent as container size. However, there exist a noticeably higher proportion of purchases for the non-fat product among organic (Table 5). Skim milk represented 27 to 30 percent of organic purchases over 2004–2007, while only constituting 22 to 24 percent of conventional purchases. The disparities in purchases by fat content can in part be attributed to organic consumers' affinity for healthier foods [17,18]—non-fat milk over higher fat content milk (i.e., low-fat and whole). It is interesting to note that while the relative shares of fat content in conventional milk purchases have remained relatively stable over time, the shares of non-fat/skim organic milk purchases have steadily decreased from 30 percent in 2004 to 27 percent in 2007. Our conjecture suggests that consumers may be unconsciously or consciously compensating higher fat content with the organic feature, which remains to be seen.

As noted previously, half gallons are the preferred container size for organic consumers. Therefore, in Figure 5, we present the average quarterly price of half gallons. The organic premium gradually increased from the second quarter of 2004 (67 percent) through the third quarter of 2006 (91 percent). However, as conventional milk prices began to steadily rise in 2007, organic prices started to show a slight decrease (possibly due to the private label invasion), causing premiums for half gallons to plunge below 50 percent in the second half of 2007. The shrinking relative price for organic milk could be a key factor in the sector's large growth throughout 2007 displayed in Figure 1.

Figure 5. Average quarterly price of organic and conventional milk in half gallons, 2004–2007.



Source: Compiled from Nielsen's Homescan Panel (UPC), 2004–2007.

As shown in Table 6, the share of the American milk dollar spent on organic was 3.6 percent in 2007, up from 1.3 percent in 2004. We observed that spending among milk consumers is different from fresh produce in many regards. For example, like fresh produce, the non-Caucasian populations spend a relatively larger amount on organic milk than the white population. Yet in contrast to fresh produce, the Asian population not only holds proportionally the largest amount of dollars spent on organic milk in 2007 (10.3 percent), but has also been increasing their share. Similarly, households of Other ethnicity also spent an increasing larger proportion of their milk budget on organic milk, reaching 7.29 percent in 2007. This observation suggests that among the non-Caucasian populations

Asian and Other would prefer to spend their budget on organic milk, while Black and Hispanic would choose to spend more on organic fresh produce.

With regards to income, households earning over \$60,000 per year consistently spent a higher share of their milk dollar on organic than the average American. In 2007, households making over \$100,000 spent 6.9 percent of milk dollars on organic versus 1.6 percent for those with incomes under \$25,000. The differences between organic spending on milk and produce with regards to income may be expected due to the relatively higher organic milk premium. Lin *et al.* [7] found organic prices for selected fresh produce to range from 20 to 60 percent above conventional prices, while Smith *et al.* [8] estimated premiums for organic milk in 2006 to fall in the range of 60 to 109 percent. Once more, higher educational attainment is correlated with higher spending on organic milk, and this association is well documented in the literature for most organic foods [10,16]. Unlike fresh produce, the share of spending on organic milk has increased steadily from 2004 to 2007 regardless of the level of educational attainment. In 2007, households with the highest educational attainment spent 6.5 percent of their milk budget on organic fluid milk, which is much greater than the combined shares of organic milk spending by those households with lower educational attainment.

Table 6. Share of U.S. fluid milk expenditures spent on organic.

Demographic	Organic share of spending (%)			
	2004	2005	2006	2007
Total U.S. population	1.31	1.91	2.68	3.57
Race/ethnicity				
White	1.26	1.78	2.47	3.11
Black	0.82	1.14	3.10	3.71
Hispanic	1.66	2.62	2.83	4.57
Asian	3.03	4.97	4.77	10.32
Other	1.48	2.44	6.30	7.29
Income (\$1,000)				
< 25	0.92	1.52	1.75	1.60
25 – 34.9	0.77	0.99	2.40	1.92
35 – 44.9	0.97	1.60	1.88	1.99
45 – 59.9	0.99	1.62	2.07	3.14
60 – 99.9	1.68	2.29	3.09	4.19
100 +	4.14	5.19	4.96	6.93
Education				
High school or less	0.32	0.49	0.79	1.22
Some college	1.05	1.62	2.47	2.77
College and beyond	2.43	3.40	4.62	6.50

Source: Compiled from Nielsen's Homescan Panel (UPC), 2004–2007.

3.4. Organic Strained Baby Food Sector

There are approximately 17 million children in the U.S. under the age of four, requiring unique foods necessary for growth and development. This age group of consumers represents a profitable market segment of the food industry that sold almost \$4 billion in baby food annually. *NBJ* [4] estimates that U.S. organic baby food sales grew to \$268 million in 2007, up 16 percent over the previous year. Organic baby food is often considered as a “gateway food” into the organic market, Maguire *et al.* [20] suggested that the rising sales of organic baby food could be attributed primarily to parents’ desire to reduce food safety and health risks of their babies’ exposure to pesticide residues. The baby food sector not only includes formulas, teething biscuits, juices, and cereals, but strained baby foods as well. For our analysis, we concentrate on the later, as it is a dominant portion of the baby food sector and is easily identifiable from the Homescan panel. Strained baby food comes in many flavors: fruits, vegetables, and multiple ingredient dinners consisting of a combination of fruits, vegetables, and/or meat. Strained baby food is also sold in three stages (corresponding to container size) and is becoming more frequently offered in bulk packaging (two or more containers packaged together). Stage 1 baby food is finely puréed, generally offered in 2.5 ounce containers and is one of the first solid foods babies eat. Babies then move to stage 2 foods that generally come in 3.5 to 4 ounce sizes. Finally, babies eat stage 3 baby foods (6 ounces) that have more texture and small chunks of food to promote chewing.

Table 7. The percent of organic and conventional strained baby food purchases with respect to stage, food content, and packaging.

Characteristic	Organic purchases (%)				Conventional purchases (%)			
	2004	2005	2006	2007	2004	2005	2006	2007
Stage								
1 (<3.5 oz.)	19.99	19.03	19.19	20.82	21.73	21.79	19.17	18.62
2 (3.5–5 oz.)	79.42	79.64	77.80	69.91	56.60	56.18	58.87	55.37
3 (>5 oz.)	0.59	1.32	3.01	9.26	21.67	22.03	21.96	26.01
Food content								
Fruit	41.94	43.68	44.50	42.17	36.93	33.97	36.27	36.03
Vegetable	28.06	30.77	29.65	33.60	24.67	26.15	26.75	26.50
Dinners (no meat)	13.08	13.04	12.37	9.87	6.05	6.28	6.60	8.05
Dinners (w/ meat)	16.92	12.28	12.16	9.08	31.54	31.48	29.30	28.90
Assorted varieties	0.00	0.23	1.32	5.27	0.80	2.12	1.08	0.52
Multipack	2.06	2.51	27.42	56.39	24.26	25.52	34.38	38.96

Source: Compiled from Nielsen’s Homescan Panel (UPC), 2004–2007.

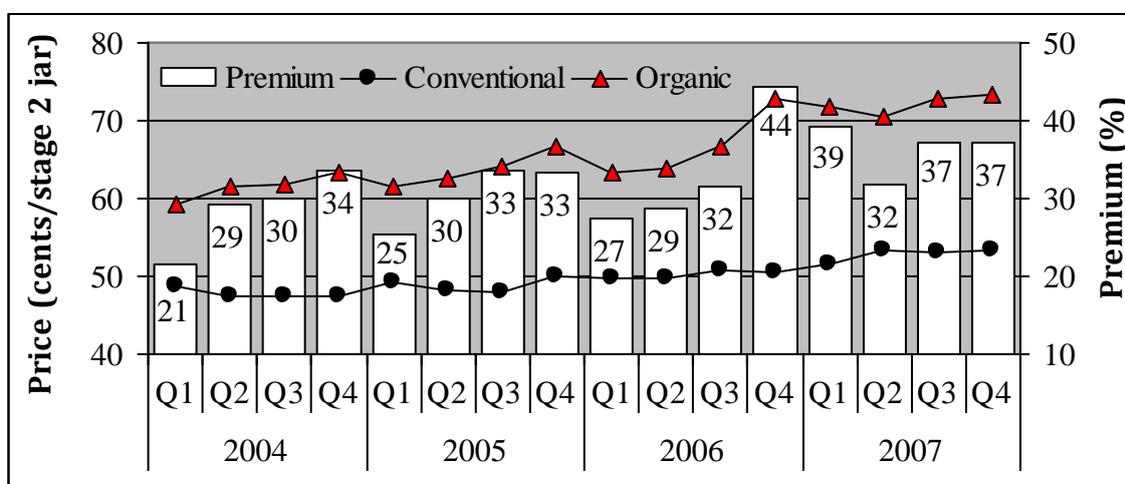
Table 7 presents the distribution of strained baby food purchases by stage, food content, and bulk packaging. Previous studies [19–21] observed that organic strained baby food was predominantly available in stage 2 containers. Using nationally representative supermarket scanner data, Thompson and Glaser [19] found that from 1989 to 1993, 100 percent of organic strained baby food was purchased in stage 2 containers. That number stayed above 90 percent for the remainder of the study

years (1994–1999), while the percentage of conventional baby food purchased in stage 2 containers was in the 52 to 57 percent range for 1989–1999. One possible explanation is that stages 1 and 3 have closely related and easily attainable substitutes—formula, cereals, and breast milk for stage 1, and table food for stage 3—whereas the most likely substitute for stage 2 baby food is homemade, which can be time consuming to make for the parent. As the organic sector continues to grow, we find that the percentage of stage 2 purchases is still on the decline from about 80 to 70 percent in 2004–2007.

Strained baby food containing predominantly fruits and vegetables, but with no meat, is purchased at a higher frequency for organic than for conventional. In fact, 85.6 percent of organic purchases (fruits, vegetables, and dinners without meat) contained no meat in 2007, while 9.1 percent contained meat and 5.3 percent came in undistinguishable assorted varieties, as compared to 70.6 (no meat), 28.9 (meat) and 0.5 (assorted) for conventional purchases.

Parents generally buy more than one jar of baby food per shopping trip. The evolution of bulk package purchases found in both the organic and conventional markets is quite striking. In 2004, 2.1 and 24.3 percent of organic and conventional strained baby food jars were purchased in bulk, respectively. By 2007, over 56 percent of organic strained baby food purchases constituted a bundled package of at least two jars (or plastic tubs) as compared to nearly 40 percent of conventional purchases. Buying food in bulk, or pre-bundled packages, generally comes with a price discount. However, two studies investigating the price of strained baby food in two selected U.S. cities in 2001 [20] and at the national level in 2006 [9] found this not to be true. It appears the bundled packages offer more convenience rather than a price discount, and consumers pay for that convenience through negating a price discount.

Figure 6. Average quarterly price of organic and conventional strained fruit flavored baby food in stage 2 containers, 2004–2007.



Source: Compiled from Nielsen's Homescan Panel (UPC), 2004–2007.

For comparison of prices, we concentrate on fruit flavored stage 2 strained baby food, as this is the most frequently purchased organic and conventional baby food and offers a heterogeneous product. However, we note that preliminary comparisons of other stage/food content combinations resulted in similar price trends. Given that baby food is a relatively shelf-stable product (as compared to fresh

produce and milk) it is not surprising to see a non-cyclical and reasonably smooth trend. However, as seen in Figure 6, the price for organic appears to be increasing faster than conventional. Through most of 2004–2006 premiums remained around 30 percent, but were wholly above 30 percent throughout 2007. Again, the upward trending of organic premium on baby food represents a market condition of increasing demand for organic baby food relative to its conventional counterparts.

As shown in Table 8, spending on organic relative to conventional strained baby food is noticeably larger than the previous three foods investigated. Previous studies have found that parents of young children and infants are more likely to purchase organic foods [10,22]. Given baby food's target market, it may be of no surprise to see such a stark difference in spending. Our analysis of the Homescan data shows that the average American spent almost 8 percent of their strained baby food dollars on organic in 2004, and that number increased to just over 14 percent in 2007.

Table 8. Share of strained baby food expenditures spent on organic.

Demographic	Organic share of spending (%)			
	2004	2005	2006	2007
Total U.S. population	8.29	9.03	11.31	14.78
Race/ethnicity				
White	8.78	9.37	10.10	14.10
Black	3.02	5.74	5.91	10.64
Hispanic	7.32	9.15	13.75	17.83
Asian	18.24	17.16	25.69	24.08
Other	10.74	4.83	30.42	17.80
Income (\$1,000)				
<25	4.79	3.51	4.71	9.29
25–34.9	3.85	4.35	8.02	11.01
35–44.9	4.36	10.80	4.87	10.68
45–59.9	11.08	7.31	9.37	11.47
60–99.9	8.50	10.03	13.18	13.42
100+	16.90	21.56	20.25	23.13
Education				
High school or less	4.13	2.93	4.61	6.45
Some college	6.49	8.36	8.50	10.99
College and beyond	11.65	12.10	15.65	19.62

Source: Compiled from Nielsen's Homescan Panel (UPC), 2004–2007.

Like fluid milk and in contrast to fresh produce, the Asian population spent proportionally more on organic than other races/ethnicities over 2004–2007. However, like produce and milk, Hispanic-Americans also showed a relatively high propensity to spend on organic, especially in 2007 when 17.8 percent of their spending went to organic (Table 8). In general (and similar to milk), income is positively correlated to the organic share of dollars spent on baby food. As the organic baby food sector evolved over the four year period, the relationship between income and organic spending has become

more clearly defined. Like the previous three food sectors, there appears to be a clear association between educational attainment and organic spending. Overall, we found that organic spending has been strongly and consistently associated with educational attainment across all four food sectors investigated.

4. Discussion and Conclusions

This study extends the literature by closely examining four sectors—fruits, vegetables, milk, and baby food—within the organic food market and presenting detailed descriptive analyses. Using Nielsen's Homescan data, we investigate intra-sector shares of sales, pricing trends, differences in conventional and organic food purchasing, as well as spending on organic across key demographics.

The study finds that retail sales in all four sectors have been increasing since the implementation of a national organic standard in late 2002. Apples, bananas, carrots, and tomatoes prove to have the highest share of organic sales within their sectors. In fact, apples and bananas, as well as carrots and tomatoes, held roughly a third of their respective organic sectors' sales dollars in 2003–2005, and each pair garnered over 40 percent of their sectors in 2006.

Conventional and organic milk vary greatly by container size and fat content, and most notably branding—half gallon and skim milk dominate organic purchases, while organic private label purchases are making inroads. The organic share of sales within the strained baby food market is noticeably higher than both fresh produce and milk. The overall importance of these organic foods to their sectors' development is of interest to policymakers and stakeholders alike. The economic profitability or viability of the organic industry to a large extent depends on consumers' willingness to pay a price premium for organic foods. Among the four sectors investigated, the fluid milk sector has enjoyed the largest organic premium varying between 60 and 110 percent [8]. Fresh produce commands an organic premium between 20 to 60 percent [7], while organic baby food generally charges a price that is 30 to 55 percent above conventional baby food [9]. Increasing competitions most certainly will drive down the organic premiums as the organic industry continues to expand and penetrate mainstream supermarkets and mass merchandise markets,

Our findings show a diverse group of consumers willing to expend their food dollar on organic. Recent empirical studies have found a higher likelihood among non-Caucasian consumers to purchase organic food [5,10,13,14]. Our findings presented here tend to corroborate that notion. Specifically, Blacks and Hispanics tend to spend a comparatively larger proportion of their at-home fresh fruit and vegetable dollar towards organic, while the Asian-American and Other populations have decreased their organic shares. Hispanics also spend a relatively large amount on organic milk and baby food, yet Asian-Americans top these food groups in relative spending on organic. With the growing prevalence of ethnic food stores, coupled with a high propensity to spend on organic foods among non-Caucasian ethnic groups, organic food purveyors could use such information in their marketing strategies. For all four food groups, there exists an unambiguous correlation between educational attainment and organic spending—also in agreement with previous research.

With regards to income, high-income households tend to expend relatively larger amounts of their food dollars on organic for the four foods investigated. However, for fresh produce we find that low-income households also tend to spend a higher proportion of the produce dollar on organic. One

possible explanation for the bimodal income-organic spending relationship is that if lower-income households tend to spend less on fresh produce in general, then higher priced organic purchases would displace a higher proportion of their fresh produce dollar than for higher income households.

The 2007 Census of Agriculture conducted by the U.S. Department of Agriculture [23] revealed direct food sales, food sold directly to the consumer from the producer such as farmers' markets, increased 49 percent to \$1.2 billion in 2007 from \$812 million in 2002. Farms selling directly to the consumer also climbed 17 percent, from 116,733 to 136,817. Environmentally friendly (such as organic) and locally produced foods are commonly offered in direct food markets, and direct food marketing can prove to be a vital revenue-producing marketing strategy for small- and medium-sized farms [24]. As direct marketing continues to expand and establish new locals for direct sales venues to meet increasing consumer demand for organically grown foods, information presented in this study could be useful in improving marketing strategies.

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