U.S. Market Growth Outpaces Domestic Supply

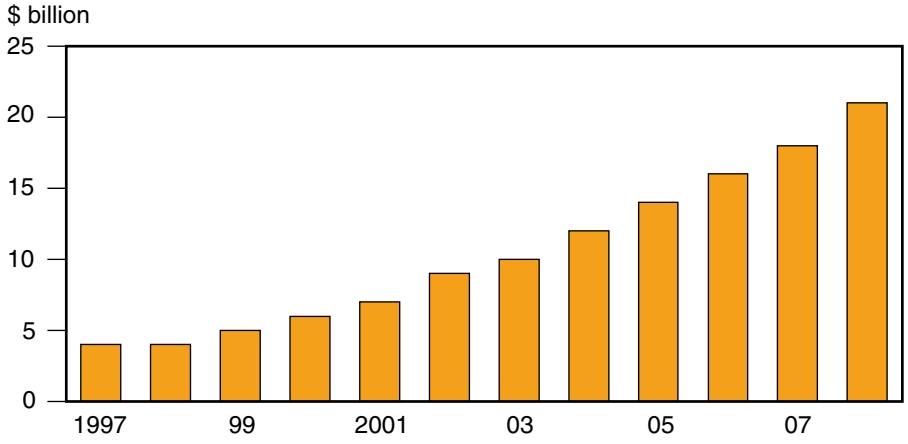
Since the late 1990s, U.S. organic production has more than doubled, but the consumer market has grown even faster. Organic products are now firmly established in the American food culture: once available only in natural product stores, organic foods are now found in mainstream venues like Wal-Mart, Target, and Costco. While organic food sales are rising from a small base and still account for only about 3 percent of total food sales, most Americans now purchase organic products at least occasionally. According to an annual industry survey, 69 percent of U.S. consumers purchased organic products in 2008 (Hartman Group, 2008).

Growing consumer interest in organic food has brought a number of changes to markets and supply chains. Long-time organic retailers, manufacturers, distributors, and farmers face new competition from their conventional food counterparts. For example, large conventional food manufacturers—such as General Mills, Kellogg's, and Dean Foods—initially gained access to organic markets by acquiring independent, successful organic companies. More recently, conventional food manufacturers have competed head-on with independent organic companies by introducing organic versions of their well-known products, such as Gerber baby food. Conventional supermarkets are introducing "private label" store-brand lines of organic food. And organic food supplies are increasingly being imported from farmers in dozens of other countries that are producing products to meet USDA's organic standards.

Organic Sales Have Quintupled Since 1997

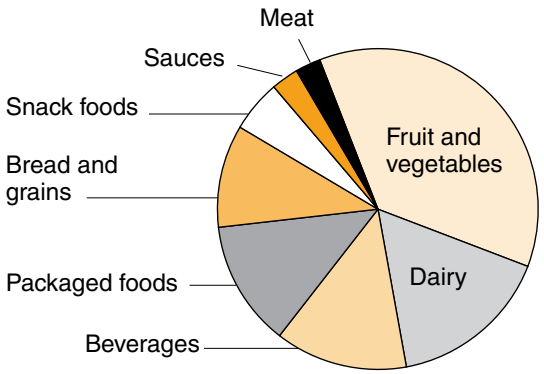
Organic food sales increased from $3.6 billion in 1997 to $21.1 billion in 2008 (fig. 1). Sales of organic foods increased annually between 12 and 21 percent during this period (*Nutrition Business Journal*, 2008). Market penetration has also grown steadily; organic food products accounted for over 3 percent of total U.S. food sales in 2008. The top two categories—produce

Figure 1
U.S. organic food sales topped $21 billion in 2008



Source: *Nutrition Business Journal.*

Figure 2
Fruits, vegetables, and dairy accounted for over half of the $19 billion organic food market in 2007



Source: *Nutrition Business Journal.*

and dairy products—accounted for over half of organic food sales (fig. 2). These categories are followed by soymilk and other beverages, packaged foods, breads/grains, snack foods, condiments, and meat.

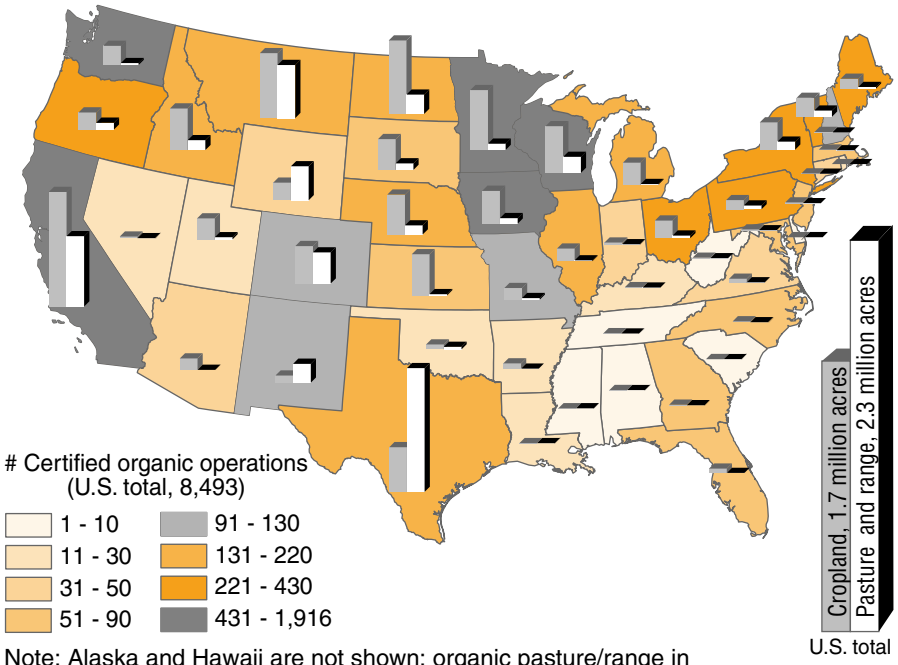
Other organic products (herbal supplements, personal care products, pet food, flowers, linens, and clothing) are growing from a smaller base—$1.6 billion in sales in 2007—but are forecast to grow even faster than organic food sales through the end of the decade (Organic Trade Association, 2008). The fast-paced growth of organic food and other products has led to complaints of supply shortages throughout the organic supply chain.

U.S. Organic Acreage Has Doubled Since 1997, But Producers Face Challenges

U.S. certified organic crop acreage more than doubled between 1997 and 2005, and organic production has spread to every State and commodity sector (fig. 3) (USDA-ERS, 2009a). The structure of the U.S. organic production sector differs substantially from the conventional sector: fruits and vegetables account for a much larger percentage of total organic acreage, and organic farms tend to be smaller than conventional farms (Greene and Kremen, 2003; McBride and Greene, 2007). Small-scale organic operations market directly to consumers, as well as to wholesalers, natural food stores, and supermarkets. Many organic production sectors, including fruits, vegetables, dairy, and poultry, are expanding rapidly in the United States. However, the pace of expansion has slowed in some sectors, and organic acreage for some crops—including cotton and soybeans—declined between 2000 and 2005.

The overall adoption level for organic agriculture is still low—only about 0.5 percent of all U.S. cropland and 0.5 percent of all U.S. pasture was certified organic in 2005. Although nearly 5 percent of U.S. vegetable acreage and 2.5 percent of fruit and nut acreage was under organic management in 2005, only 0.2 percent of U.S. corn and soybean crops were grown under certified organic farming systems (fig. 4). Conventional grain producers in the United States associate a wide variety of financial and other risks with organic production (Yeager, 2006; Wolf, 2006).

Figure 3
U.S. certified organic acreage and operations, 2005



Note: Alaska and Hawaii are not shown; organic pasture/range in Alaska accounts for 60 percent of the U.S. total.
Source: USDA Economic Research Service, based on information from USDA-accredited certifiers.

Organic Handlers Cope With Supply Shortfalls

During the early 1990s, organic farmers identified lack of consumer demand as a major marketing problem, and organic farmers frequently sold organic products into conventional markets (OFRF, 1993, OFRF, 1996). While limited demand can still be a problem at times for organic products, limited organic supply has become a bigger issue over the last decade. By the late 1990s, organic handlers—the intermediaries in organic supply chains—faced difficulty procuring large enough quantities of organic products to distribute to retailers, locating organic producers to buy from, and gaining access to shelf space in supermarkets (Dimitri and Richman, 2000).

More recently, long-time organic handlers have reported that the lack of reliable supplies for organic raw materials is a major factor that has constrained business growth (Oliver, 2006; Organic Trade Association, 2006, 2004, 2001). One of the most recurrent themes in a congressional public hearing on organic agriculture, held in April 2007, was the shortage of organic inputs, ingredients, and products (Subcommittee on Horticulture and Organic Agriculture, 2007). According to testimony from the Organic Trade Association (OTA), 52 percent of the organic companies responding to an OTA membership survey reported that "a lack of dependable supply of organic raw materials has restricted their company from generating more sales of organic products" (Wilcox, 2007).

In particular, organic dairy producers and soy food processors face shortages of domestically produced organic feed grains and soybeans (Clarkson, 2007). Quarterly farm-level prices for organic grains and feedstuffs have risen steadily since USDA began tracking prices for these products in January

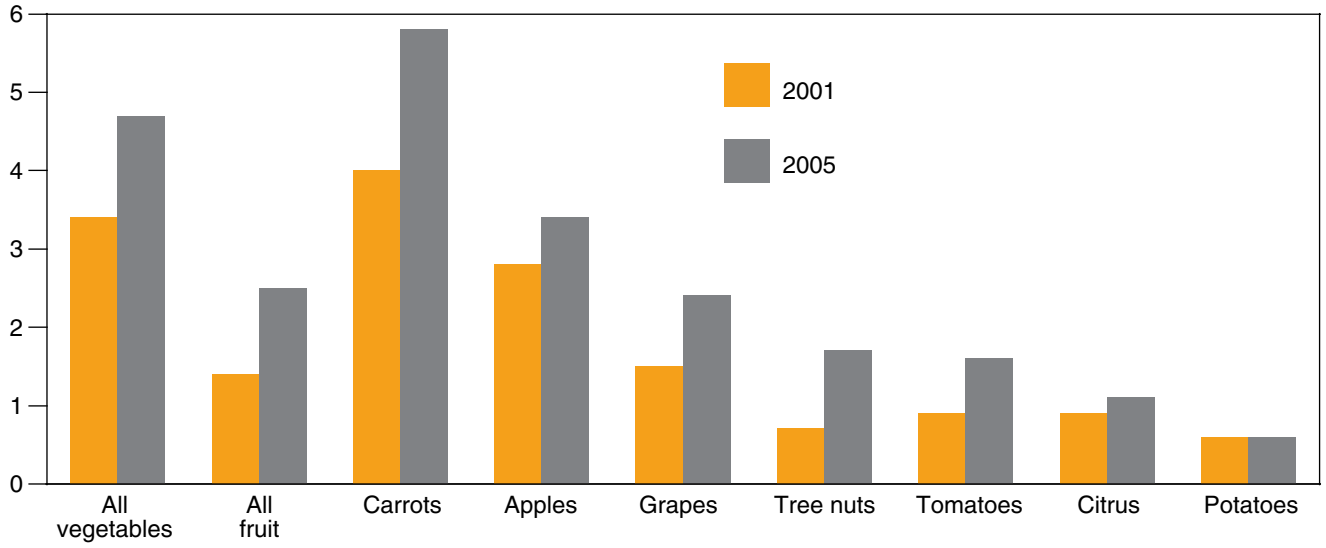
2007—in some cases more than tripling by third-quarter 2008—outpacing conventional grain price increases and reflecting tight organic supplies.

In 2005, ERS surveyed all certified organic handlers in the United States (approximately 2,790 facilities) about their practices in 2004 (Dimitri and Oberholtzer, 2008b). Organic handlers (including brokers, distributors, wholesalers, and manufacturers) must maintain the organic integrity of a product as it moves along the supply chain, but can achieve compliance with the national standards quicker than farmers. Facilities were few in most States, with the Pacific States accounting for 41 percent of the total. In 2004, many organic handlers were small; 48 percent reported $1 million or less in total gross sales (both organic and conventional products) (fig. 5). Just 3 percent of handlers reported over $100 million in sales. Most organic handling

Figure 4

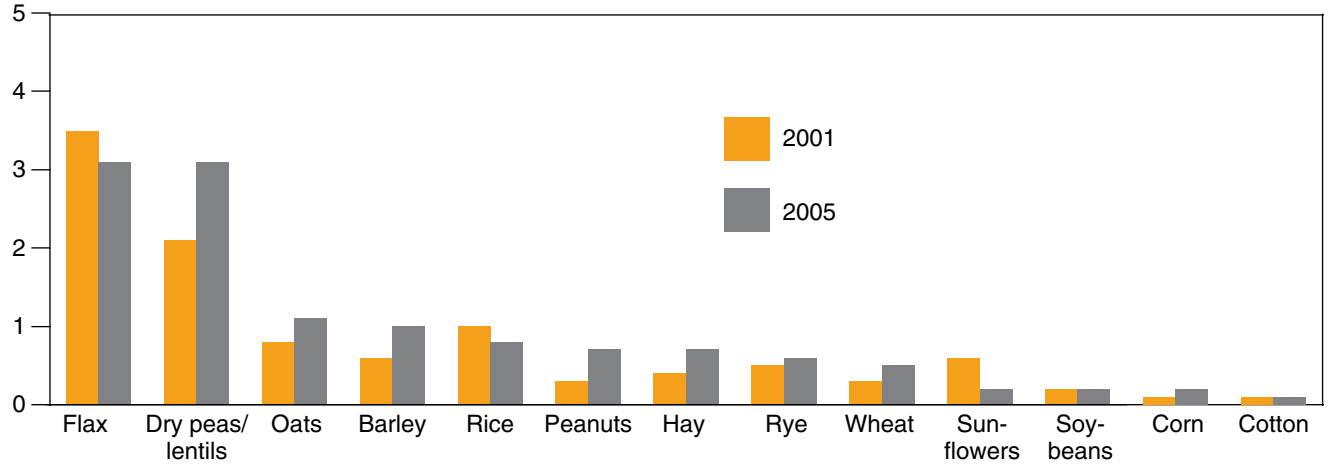
In the U.S., adoption of certified organic systems is highest for fruit and vegetables

Certified organic acres as a percent of total U.S. acres



While certified organic systems are also used for grain crops, adoption is higher for grains with food uses

Certified organic acres as a percent of total U.S. acres



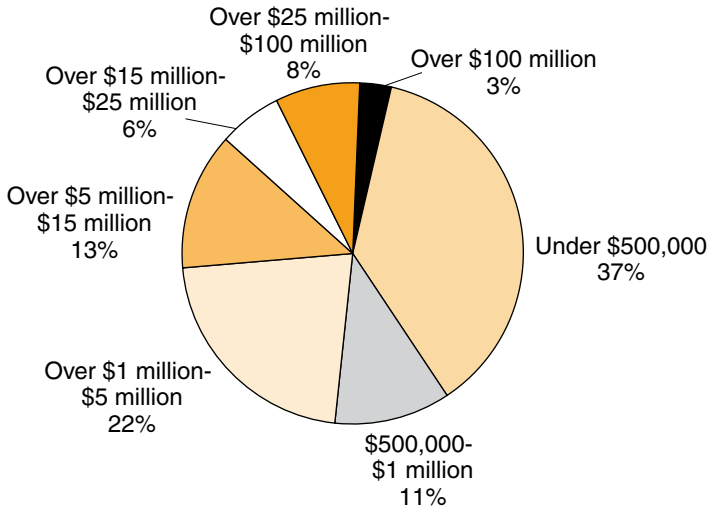
Source: "Data Track the Expansion of International and U.S. Organic Farming," *Amber Waves*, 2007.

firms are mixed operations, handling both organic and conventional products; on average, 34 percent of the sales handled by these firms were organic.

According to the survey findings, 13 percent of all handlers were unable to meet market demand (that is, they experienced critical shortages for at least one of their organic products) during 2004 (Dimitri and Oberholtzer, 2008a). The share of handlers unable to meet market demand varied by the product sold and was highest for milk (fig. 6). These product shortages are mirrored by handlers' difficulties procuring ingredients: 44 percent of handlers found needed ingredients or products in short supply during 2004. The main products and ingredients handlers found in limited supply were coffee, soybeans, milk, seeds (includes seeds for planting), corn, and nuts.

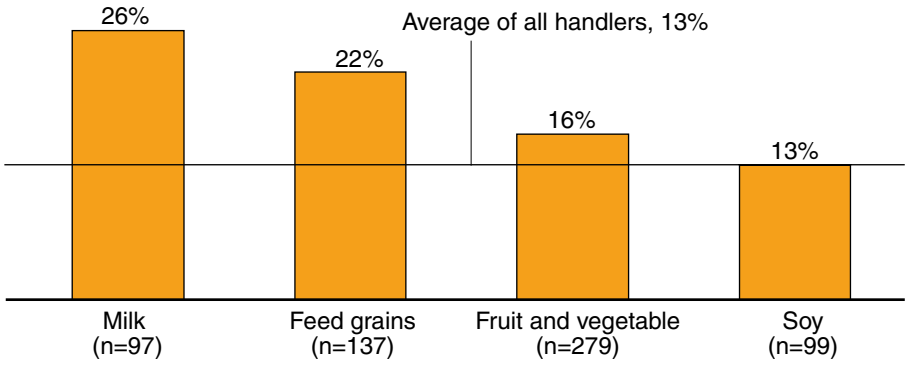
Organic handlers are using a number of mechanisms to cope with shortfalls, such as developing relationships with new or less experienced suppliers, being flexible on shipment size, and providing technical advice (fig. 7).

Figure 5
Share of organic handlers by size of company sales in 2004*



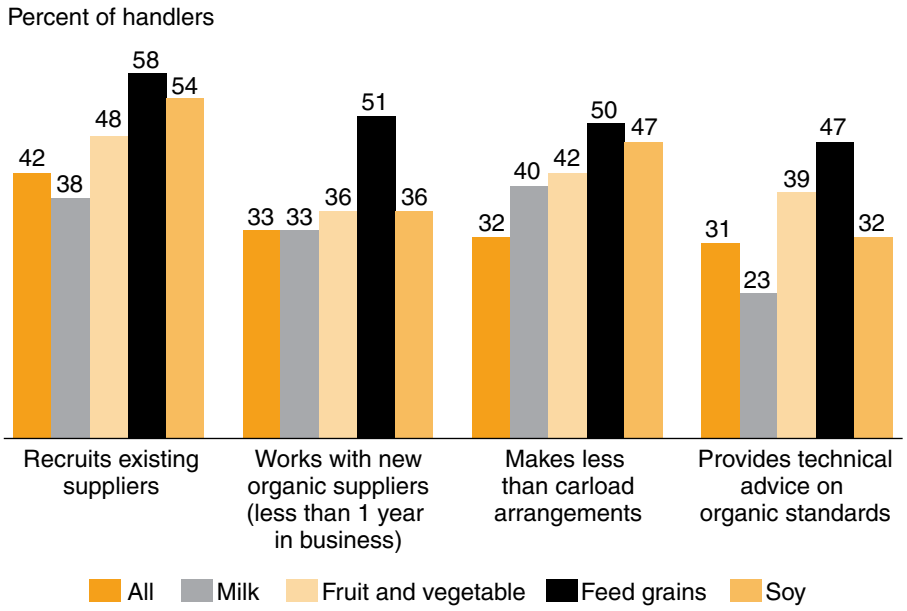
*Includes handlers' gross sales of both organic and conventional products.
Source: 2004 Nationwide Handler Survey, Economic Research Service, USDA.

Figure 6
Percent of handlers with critical shortage, by main product sold



Source: 2004 Nationwide Handler Survey, Economic Research Service, USDA.

Figure 7
Handlers work with their suppliers in many ways, 2004



Source: 2004 Nationwide Handler Survey, Economic Research Service, USDA.

Handlers willing to work with suppliers new to the organic industry have access to a wider range of supply. Feedgrain handlers are the most willing to work with suppliers new to the sector and, along with soy handlers, are the most flexible about accepting smaller shipments of organic supplies.

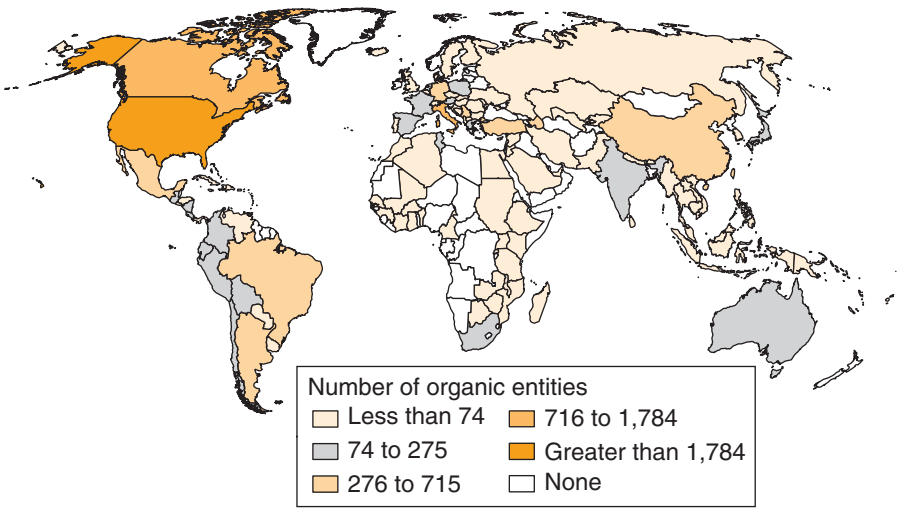
The Search for Organic Supply Goes Global

The U.S. National Organic Program (NOP) streamlined the certification process for international as well as domestic trade when it was implemented in 2002. Organic farmers and handlers anywhere in the world are permitted to export organic products to the United States if they meet NOP standards, along with other regulatory standards, and are certified by a public or private organic certification body with USDA accreditation. In 2007, USDA-accredited groups certified 27,000 producers and handlers worldwide to the U.S. organic standard, with approximately 16,000 in the United States and 11,000 in over 100 foreign countries (fig. 8). Farmers and handlers certified to NOP standards are most numerous in Canada, Italy, Turkey, China, and Mexico, which together accounted for half the total foreign organic farmers/handlers in 2007.

The United States does not have updated, consistent data on organic trade because organic product codes have not yet been added to the U.S. and international harmonized system of trade codes. A USDA report estimated that the value of U.S. organic imports in 2002 was $1.0-$1.5 billion and the value of U.S. organic exports was $125-$250 million (USDA-FAS, 2005). Organic imports have increased substantially since 2002, and include fresh fruits and vegetables, products not grown in the United States (such as coffee, tea, cocoa, and tropical produce), and raw ingredients, including soybeans.

Imports have increased as growth in organic demand has exceeded domestic supply. Organic farming is often labor intensive, and developing countries

Figure 8
Number of certified organic entities (farmers and handlers) by country, 2007



Source: USDA National Organic Program.

with lower farm labor costs may have a competitive advantage for some organic products. While USDA's survey of organic distributors, processors, and other handlers indicated that they relied primarily on domestic suppliers, 38 percent imported some or all of their organic products in 2004 (Dimitri and Oberholtzer, 2008a).

Despite the rapid growth of the organic sector and entry of larger organic farms over the last decade, the smallest U.S. organic farms have maintained a stable share of the organic sector (Grow and Greene, 2009). Small-scale farmers producing a wide variety of horticultural products—and increasingly livestock products—for sale in direct markets have likely seen the least impact from competition with more distant suppliers. Organic consumers at farmers' markets, independent restaurants, small food shops, and other direct markets are explicitly seeking locally grown organic products. However, some fruit and vegetable growers who marketed to natural foods grocery stores during the 1990s have reported losing some of their markets to imports and to larger domestic producers as these stores have expanded beyond their original markets (Hanson et al., 2004).

U.S. organic grain and oilseed producers also face international market competition. U.S. organic cotton producers began losing market share in the 1990s to countries with lower labor, input, and technology costs (Greene and Kremen, 2003). U.S. organic soybean production started declining several years ago despite increasing demand for organic feed grains and consumer products such as soymilk. U.S. feed grain distributors and soy product manufacturers report sourcing organic soybeans from other countries.

Organic Food Costs More To Produce

USDA surveyed organic milk producers in 2005, organic soybean producers in 2006, and organic apple producers in 2007 as part of USDA's annual

survey of farm and ranch operators—the Agricultural Resource Management Survey (ARMS)—and will survey organic wheat producers in 2009. These surveys sample organic producers at much higher rates than their occurrence in the population in order to develop sufficient data for a comparison of practices and costs on conventional and organic farms. ERS has completed analysis of organic dairy and soybean production costs and returns.

Organic Dairy Costs and Returns. Organic dairy emerged as a fast growing sector in the late 1990s, and certified organic milk accounted for over 3 percent of U.S. sales of fluid milk products in 2008 (USDA-AMS, 2008). Organic milk producers usually begin as operators of conventional dairies before undergoing what can be a challenging and costly transition process. Conventional dairy producers need to adjust their approach to dairy herd management during the transition to comply with USDA organic standards.

The primary difference in the production practices used by organic versus conventional dairies is in the feeding system (McBride and Greene, 2007). In 2005, more than 60 percent of organic operations reported using pasture-based feeding that provides more than half of seasonal forage (during the grazing months) from pasture, compared to just 18 percent of other operations (table 1). The growth hormone rbST is not available to organic producers, but was used by 17 percent of conventional operations, who also were much more likely to utilize regular veterinary services and a nutritionist. The use of these practices likely contributed to the significantly higher production per cow on conventional versus organic operations. Organic operations averaged about 13,600 pounds of milk per cow in 2005, versus nearly 19,000 pounds on conventional operations.

Measuring Production Costs

ERS computes three levels of production costs for a farm operation. **Operating costs** include costs for feed; veterinary and medical services; bedding and litter; marketing; custom services; fuel, lubrication, and electricity; repairs; hired labor; other costs; and operating interest. **Capital ownership costs** include the annualized cost of maintaining the capital investment (economic depreciation and interest) in the operation, and costs for non-real estate property taxes and insurance. **Total economic costs** are the sum of operating and capital ownership costs, plus opportunity costs for unpaid labor and land, and allocated costs for general farm overhead items.

Total operating costs is an indicator of the relative success of farm operations in terms of their ability to meet short-term financial obligations. The sum of operating and capital ownership costs provides an indicator of whether operations can replace capital assets as needed and thus stay in business over time. Other costs are primarily opportunity costs of owned resources (land and labor) that may or may not influence production decisions.

For organic farm operations, the estimated costs of transitioning to certified organic production are also included in total economic costs. A farm operation must be managed organically for 3 years prior to receiving organic certification and organic price premiums. The higher organic production costs during this period can be considered as the investment necessary to earn higher organic prices over the expected life of the operation.

Costs of production for organic and conventional dairy systems were examined to determine whether organic milk price premiums make organic systems competitive with conventional systems. Average operating and capital costs for organic dairies, including an estimate of the additional costs incurred during transition, were an estimated $6.38 per cwt of milk higher than for conventional dairies in 2005. With an average price premium of $6.69 per cwt for organic milk, organic milk producers, on average, covered the additional operating and capital costs of organic production in 2005. This suggests that there may be an economic incentive for small existing dairies (which often have above-average production costs) to transition to organic production.

Table 1
Characteristics and practices of conventional and organic dairy operations, U.S., 2005[1]

Item	Type of dairy operation		
	Conventional	Organic	t-stat
Milk cows (per farm)	156	82	1.20
Milk production (lbs per cow)	18,983	13,601	2.63
Region (percent of farms/cows)			
Northeast (ME, NY, PA, VT)	26/17	41/26	1.25/2.55
Upper Midwest (MI, MN, WI)	39/25	43/34	0.13/2.36
Corn Belt (IL, IN, IA, MO, OH)	15/10	8/8	1.18/0.71
Southeast (FL, GA, KY, TN, VA)	6/6	0/0	na
Southwest (AZ, NM, TX)	2/10	0/0	na
West (CA, ID, OR, WA)	11/32	7/32	0.90/0.03
Region (milk cows per farm)			
Northeast (ME, NY, PA, VT)	104	52	0.74
Upper Midwest (MI, MN, WI)	98	64	0.34
Corn Belt (IL, IN, IA, MO, OH)	108	75	0.46
Southeast (FL, GA, KY, TN, VA)	152	0	na
Southwest (AZ, NM, TX)	781	0	na
West (CA, ID, OR, WA)	431	381	0.16
Farm operator			
Off-farm occupation (percent of farms)	2	4	0.24
Education (percent of farms)			
Less than high school	18	26	0.75
Completed high school/some college	66	54	1.38
Graduated from college	16	20	0.59
Age (years)	51	49	0.66
In dairy business (years)	23	21	1.03
Selling certified organic milk (years)	na	5	na
Transition to certified organic (years)	na	2.5	na
Exit dairy business (percent of farms)			
5 years or less	25	16	1.27
10 years or less	51	33	1.99
20 or more years	30	47	2.05
Production practices (percent of farms)			
Pasture based feeding	18	63	6.42
rbST	17	0	na
Regular veterinary services	69	38	3.69
Nutritionist	72	45	3.38
Number of observations	1,462	325	

[1] Statistical significance in test of equality of means is indicated by t-statistics greater than 1.96 and 1.65 at the 5 and 10 percent levels, respectively. na = not applicable.

Source: 2005 Agricultural Resource Management Survey.

Most organic dairies are small operations, with returns that compare favorably with those of small conventional operations. However, at their scale of operation, potential returns to operator labor and management are limited. When the opportunity cost of unpaid labor is included, the average total economic cost of organic milk production was higher than the organic milk price premium in 2005. This suggests that although there may be an economic incentive for small dairies that have already committed much of the fixed investment in milk production to consider becoming organic, the economic incentive for startup organic dairies (which don't have any sunk costs that can be ignored) may be limited. Also, market conditions for organic milk have changed substantially since 2005, with falling milk prices and higher input costs, and many existing organic dairies are currently showing losses (USDA-ERS, 2009b).

Organic Soybean Costs and Returns. Organic soybean acreage in the United States has been stagnant since the early 2000s, despite the fast-growing market for organic soymilk and feed grains, and large price premiums for organic soybeans. Since multidisciplinary research results suggest that growing organic soybeans can be more profitable than growing conventional soybeans, the lack of growth in domestic soybean production relates to a variety of other factors. According to Lynn Clarkson—president of the largest organic grain supply company in the United States—grain supplies are tight despite high demand and price premiums for many reasons: the 3-year lag due to the organic transition period requirement, fewer organic marketing outlets, the need for onfarm storage, the lack of third-party contractors for organic pest and nutrient management, heavy managerial requirements, fear of criticism from neighbors, unknown risks, lack of government infrastructure support, and subsidies for ethanol that increase demand for conventional grain supplies (Clarkson, 2007). Also, as the number of organic soybean producers has increased worldwide, U.S. producers have faced increased competition for the domestic market, as well as for the Japanese organic soybean market, which was a major purchaser of U.S. organic soybeans in the late 1990s and early 2000s.

Research comparing organic and conventional soybean production with long-term experimental trials—using the same seed variety, soil and other conditions—shows that organic cropping systems generate yields and economic returns equal to or greater than those of conventional systems and sometimes much greater returns (Pimentel et al., 2005; Delate et al., 2003; Mahoney et al., 2004; Smith et al., 2004; Hanson et al., 1997). ARMS soybean survey results reflect the commercial setting and the "human factor"—that valuable system of local knowledge and expertise that every farmer acquires through onfarm experience and experiments that plays an especially crucial role in organic farming.

ERS analysis of the 2006 ARMS data from Midwest and Corn Belt States indicates that organic soybean production is conducted on smaller operations than conventional production and that production practices are different (McBride and Greene, 2008). Nearly all conventional producers used genetically modified herbicide-tolerant seed (feed grade) in 2006, while most organic producers used a food-grade seed (table 2). Most conventional farmers used a 3-year rotation of continuous row crops, whereas organic producers more often rotated soybeans with small grains and hay crops. Despite

their smaller size, organic soybean farmers are less likely to report off-farm employment as their major occupation, reflecting higher labor requirements with organic farming.

Average soybean operating costs per acre were not significantly different between conventional and organic producers, but total operating and capital ownership costs and total economic costs were higher for organic soybean production. Conventional producers had higher chemical costs, while organic

Table 2

Characteristics and practices of conventional and organic soybean farms, Corn Belt and Midwest, 2006[1]

Item	Type of farm		
	Conventional	Organic	t-stat
Farm characteristic:			
Harvested soybean acres (per farm)	272	117	7.42
Farm acres operated (per farm)	748	478	4.41
Farm operator			
Off-farm occupation (percent of farms)	26	16	3.18
Age (years)	55	54	1.28
More than 65 years (percent of farms)	24	14	2.97
Education (percent of farms)			
Less than high school	5	18	1.73
Completed high school	46	24	3.86
Attended college	50	57	1.07
MI, MN, or WI (percent of farms)	24	51	3.23
Soybean production practice:			
Seed (percent of farms)			
GM herbicide tolerant	97	0	na
Organic clear hilum	0	68	na
Organic other food grade	0	15	na
Organic non-food grade	0	13	na
Other seed	3	5	1.52
Planted in conventional rows	60	92	11.54
Crop rotation (percent of farms)			
Monoculture	4	1	2.58
Continuous row crop	79	19	12.15
Row crops and small grains	4	24	3.13
Idle year	9	40	3.76
Meadow crop	4	17	3.04
Field operation (percent of farms)			
Moldboard plow	5	36	4.53
No-till planter	50	6	14.89
Row cultivator	3	65	9.28
Other practices (percent of farms)			
Irrigation	5	3	1.52
Applied commercial fertilizer	32	7	10.57
Applied manure or compost	7	28	3.08
Soybean yield and price:			
Yield (bushels per planted acre)	47	31	8.63
Price received (dollars per bushel)	5.48	14.64	27.24
Number of observations	1,425	237	

[1] Statistical significance in test of equality of means is indicated by t-statistics greater than 1.96 and 1.65 at the 5 and 10 percent levels, respectively. na = not applicable.

Source: 2006 Agricultural Resource Management Survey

producers substituted field operations for chemicals and had higher fuel, repair, and hired labor costs. They also used more unpaid labor. Average organic soybean yield was lower than that of conventional producers (31 versus 47 bushels per acre), partly because food-grade soybeans produce lower yield than feed-grade soybeans. Average costs for producing organic soybeans were as much as $6.20 per bushel higher than conventional production in 2006, after accounting for the influence of other factors on production costs, including organic transition costs (McBride and Greene, 2007). The average price premium for organic soybeans was $9.16 per bushel in 2006, suggesting that organic soybean producers, on average, were sufficiently compensated in 2006 for the additional costs of organic production.

Organic soybeans were more profitable in 2006 than conventional soybeans mainly because of the significant price premiums paid for organic soybeans. However, prices for conventional soybeans increased dramatically in 2007, reducing the organic price premiums from the 2006 level. The yield and cost relationship shown in the ARMS data suggests that when conventional soybean prices are high, organic systems lose their appeal, leading to slower adoption, and even declines in acres planted to organic soybeans.

Organic Agriculture Provides Ecosystem Services

USDA's national regulatory program explicitly defines organic agriculture as an ecological production system, established "to respond to site-specific conditions by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity" (USDA AMS, 2000). In setting soil fertility and crop nutrient management practice standards, USDA requires organic producers to use practices that maintain or improve the physical, chemical, and biological condition of soil and minimize soil erosion. In setting standards for organic livestock, USDA specifies that producers must accommodate an animal's natural nutritional and behavioral requirements, ensuring that dairy cows and other ruminants, for example, have access to pasture. USDA's organic livestock standards also incorporate requirements for living conditions, feed rations, and health care practices suitable to the needs of the particular species.

Environmental benefits that can be attributed to organic production systems include the following:

- **Reduced pesticide residues in water and food.** Organic production systems virtually eliminate synthetic pesticide use, and reducing pesticide use has been an ongoing U.S. public health goal as scientists continue to document its unintentional effects on nontarget species, including humans.
- **Reduced nutrient pollution; improved soil tilth, soil organic matter, and productivity; and lower energy use.** A number of studies have documented these environmental improvements in comparing organic farming systems with conventional systems (USDA Study Team on Organic Farming, 1980; Smolik et al., 1993; Reganold et al., 2001; Mäder et al., 2002; Marriott and Wander, 2006).

- **Carbon sequestration.** Soils in organic farming systems (which use cover crops, crop rotation, fallowing, and animal and green manures) may also sequester as much carbon as soils under other carbon sequestration strategies and could help reduce carbon levels in the atmosphere (Lal et al., 1998; Drinkwater et al., 1998, International Trade Centre-United Nations/World Trade Organization and FiBL, 2007).
- **Enhanced biodiversity.** A number of studies have found that organic farming practices enhance the biodiversity found in organic fields compared with conventional fields (Mäder et al., 2002; Altieri, 1999) and improve biodiversity in field margins (Soil Association, 2000).

Despite the potential for organic agriculture to improve the environmental performance of U.S. agriculture, the national standard is having only a modest impact on environmental externalities caused by conventional production methods because the organic adoption rate is so low.