DETERMINANTS OF ORGANIC DAIRY FARM PROFITABILITY:

SOME EVIDENCE FROM THE NORTHEAST UNITED STATES

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1. Introduction

Organic agriculture has become a global phenomenon over the course of a few decades, and the U.S. is leading the way in the consumption of its products (Datamonitor 2005). Compared to about 5% annual overall food industry growth, organic milk and cream sales grew by almost 690% from $190 million to $1.5 billion over the same time period (NBJ, 2006). Thus, the one bright spot in the dairy sector (and agriculture overall) is the organic food sector which is growing and thriving well. Success in the organic market has been spread more or less evenly across food categories in the U.S., but dairy has consistently performed well. According to the Organic Trade Association's (OTA) 2006 Manufacturer Survey, dairy ranked second in terms of sales and third in terms of sales growth relative to other organic food categories.

While there have been several studies focusing on the economics of organic dairy farming in the past two decades (McCrory 2001; Butler 2002; Dalton et al. 2005; McBride and Greene 2007), few have examined in detail the factors driving the economic performance of organic dairy farms. Additionally, many of these existing studies produce conflicting results, suggesting a need for further research. Focusing on the Northeast organic dairy sector in particular, the principal objective of this article is to examine the factors that influence the profitability of organic dairy farms. Given the importance of the organic dairy in the US agriculture in general and in the Northeast in particular, the paucity of literature examining factors that drive the performance of this sector is quite surprising. Therefore, this study will contribute to the literature as well to the on-going policy discussions on organic farming.

The objective of this study is fulfilled by using a multivariate regression analysis. Previous studies (e.g., Mishra and Morehart, 2001; Short, 2000; El-Osta and Johnson, 1998) are drawn upon in constructing an economic model to explain factors that influence organic dairy farm profitability. Profitability is measured by three types of measurements, Net Farm Income from Farming Operations on an accrual basis (NFIFO), Net Farm Income (NFI) after taxes, and Net Income (NI). These profitability measures, NFIFO, NFI, and NI are modeled as a function of input/output prices and production constraints, which is dependent upon farm and farm operator characteristics.

This study is focused on the Northeast region of the U.S. which is represented by Pennsylvania, New York, Vermont, and Maine. In this region, the organic movement has seen significant concentration and strength (Figure 1). The results of this study are expected to show whether or not some of the most commonly discussed (in literature and in practice) factors, such as dairy farming experience, milking technology used, length of milking, dairy farmers' commitment to the farm, and operational efficiency significantly contribute to the profitability of an organic dairy farm.

2. Profitability of Organic Dairy Farms

Most of the studies focusing on organic dairy profit issue use conventional dairy farms as a control group. Dalton et al. (2005) analyzed the profitability of organic dairy production in 2004 in Maine and Vermont. They found the production of organic dairy significantly more costly than their conventional counterparts, citing feed as the most significant higher cost input to organic dairy production relative to conventional dairy farms. According to the authors, the average organic dairy farm was not found to be profitable in 2004 in Vermont and Maine.

McCrory (2001) compared the profitability of a small sample of organic and conventional dairy farms in Vermont. She found that Vermont organic dairy farms had 45 percent greater net farm income per cow than conventional farms. Vermont organic dairy farms had higher feed expenses, and lower freight and trucking, labor, herd replacement, veterinary, and medical expenses than their conventional counterparts.

Butler (2002) analyzed the profitability of a small sample of organic dairy farms in two regions of California in 1999 in comparison to conventional dairy farms in the region with somewhat conflicting results. Feed costs for the average organic dairy farm were only slightly higher on a per cow and per cwt basis than for conventional farms but were not statistically significantly different. This was assumed to be due to the substitution of expensive organic feed with homegrown fodder and pasture (Butler 2002). Overall labor costs were also not found to be significantly different between conventional and organic dairy farms (Butler 2002). However, in accord with Dalton et al. (2005), larger organic dairy farms tended to hire outside labor more often and at a higher wage than conventional dairy farms, while small family organic farms avoided the expense by utilizing family labor (Butler 2002). While herd replacement costs were additionally found to be higher for organic dairy farms on a per cow and per cwt basis, overall profitability was greater for organic dairy farms in California relative to their conventional counterparts due to the significant price premium for organic milk (Butler 2002).

Kriegl (2006) provides one of the few economic comparisons of conventional versus organic dairy farms with a focus on grass-based dairying or intensive grazing. According to Kriegl (2006), Wisconsin organic intensive graziers tend to earn lower net farm income than non-organic, intensive graziers, and higher net farm income than confinement operations. Wisconsin organic intensive graziers appreciate lower costs of production for purchased feed, veterinary and medical expenses, herd replacement, and chemicals. Wisconsin organic intensive graziers receive higher costs of production for repairs, energy, purchased seeds, and non-dependent labor (Kriegl 2006).

Short-term productivity is expected to decrease as pasture and homegrown fodder is substituted for conventional energy-dense feedstuffs and new management skills are honed to facilitate the new technology. However, purchased feed, veterinary, medical and herd replacement costs are expected to decrease. Kriegl (2006) and Dalton et al. (2005) highlight the importance the organic milk price premium, which is as volatile as the conventional milk price, plays in determining the profitability of organic dairy farms. Although there is evidence that certain types of organic dairy operations are profitable and competitive with conventional dairy production, there is no consensus among researchers and practitioners.

3. Profitability Measures to Assess Performance

There may be a misperception regarding the objectivity of measuring the financial performance of agricultural producers, or more precisely whether such objectivity exists. As Mishra and Morehart (2001) admit, financial performance is ultimately a subjective measure dependent upon the individual researcher's objectives and assumptions. It comes as no surprise then that researchers have used several different indicators to measure the financial performance of agricultural operations in previous studies.

Mishra and Morehart (2001) describe two distinct types of financial performance measures: economic and accounting measures. Economic measures tend to incorporate opportunity costs, while accounting methods do not. In their study of U.S. dairy farms, they employ an economic measure, Operator's Labor and Management Income (OLMI), which includes an estimated cost for management hours worked on farm. In doing so, they argue, they were able to analyze the structural characteristics that tend to influence the returns to dairy management, while adequately accounting for the resource base used in production.

Alternatively, El-Osta and Johnson (1998) employ two accounting measures in analyzing the financial performance of U.S. commercial dairy farms: net farm income (NFI) and net returns per unit (cwt) of milk sold (NRU). El-Osta and Johnson (1998) define NFI as a measure of revenues minus expenses accrued after adjusting for variation in crop and livestock inventories. NRU is defined as gross value product minus expenses, including capital replacement, per hundredweight of milk sold. Though opportunity costs were not incorporated, NFI and NRU arguably reflect the financial position of agricultural producers. Beyond the two examples provided, any number of variations on accounting and economic measures has been used in previous studies.

To address the apparent subjectivity and variability in financial performance measurement, there have been two efforts to establish standard measures of financial performance. The American Agricultural Economics Association (AAEA) guidelines and the Farm Financial Standards Council's (FFSC) guidelines are the products of those efforts. To simplify, in measuring profitability, which is a type of financial performance measure, the AAEA guidelines tend to isolate the costs and returns of producing individual commodities and include the opportunity costs of commodity production. The FFSC guidelines, in contrast, tend to reflect the revenues earned and expenses incurred to earn those revenues for the whole farm enterprise while adjusting for revenues and expenses that may have accrued, though not yet received/paid, during the time frame under study.

Considering the many variations in measurement of profitability, this study aims to follow the FFSC's guidelines as closely as possible. The FFSC guidelines are best suited for capturing the whole farm picture, whereas the AAEA guidelines are best for isolating individual components of the farm enterprise. Since this study focuses specifically on organic dairy farms, it is necessary to account for the whole farm enterprise in order to adequately account for farm diversity. Managing the whole farm as an organism and supporting farm diversity, in contrast to promoting specialization, is central to the organic ideal. Thus, perceiving and analyzing the whole organic farm, as opposed to a single component of a larger operation, is critical in examining such a farm model.

This study follows the FFSC's example of a farm business income statement, which measures Net Farm Income from Farming Operations on an accrual basis (NFIFO), and Net Farm Income (NFI) after taxes. An additional cost component to the income statement, withdrawals for unpaid management and labor, is added to arrive at a third profitability indicator, Net Income (NI).

3. Research Methodology

3.1 Financial Performance Measures Used in this Study

The FFSC interprets NFI as "the return to the farmer for unpaid labor, management, and owner equity" (FFSC 1997, III-16). NFIFO equals revenues minus expenses to match those revenues on an accrual basis minus depreciation. Accrual-adjusted NFI equals NFIFO minus taxes, and NI further includes the opportunity cost of management hours worked but not expensed. That is,

$$\text{NFIFO} = (\text{Farm Operating Revenues} - \text{Farm Operating Expenses}) \pm (\text{Change in Inventories}) - (\text{Depreciation}) - (\text{Interest} \pm \text{Interest Accrued}) \quad (1)$$

$$\text{NFI} = \text{NFIFO} - (\text{Taxes}) \quad (2)$$

$$\text{NI} = \text{NFI} - (\text{Withdrawals for Unpaid Labor and Management}) \quad (3)$$

The FFSC notes several limitations for each financial performance measure defined, evidencing the fact that there is no one perfect indicator. NFI's main limitation is its lack of comparability across farm businesses. Using NFI can also lead to interpretation problems due to differences in the form of business organization. For example, while NFI does not necessarily include estimates of labor costs for unpaid operator and family labor, a corporation would likely pay all farm operators and record these costs. To address some of these limitations and maximize comparability across farm businesses, NFIFO, NFI, and NI, as well as each component of the income statement, are measured in this study also on per hundredweight equivalent[1] (CWT EQ) basis.

[1] The CWT EQ method of standardization involves dividing the income statement by the USDA national average All Milk Price (Kriegl 2005). Measuring profitability on a per hundredweight equivalent (CWT EQ) basis is *not* the same as measuring profitability on a per hundredweight (CWT) basis. NFIFO/CWT, for example, equals NFIFO divided by the weight of milk sold in hundreds of pounds. NFIFO/CWT EQ, in contrast, equals NFIFO divided by the USDA national average All Milk Price.

Standardizing the income statements on a per CWT EQ basis is particularly important when examining the whole farm enterprise. As Kriegl (2005) explains, "Dairy farms have numerous sources of income: milk, cull cows, calves, [...], etc. making the use of an equivalent unit essential. In addition, most dairy farms do not separate the costs of producing crops sold for cash from the cost of producing the crops fed to the dairy herd" (p17). Examining a whole, diverse farm can lead to interpretation problems. For example, what does it mean to say that $100 per cow was spent to purchase feed on a diverse operation that also produces pork and poultry? Using an equivalent unit for standardization, milk sales equivalent in the case of this study, is a way to overcome these interpretation problems.

3.2 Factors Affecting Financial Performance

The main objective of this study is to examine the factors that influence the profitability of organic dairy farms in the Northeast U.S.A. This objective is fulfilled by using a multivariate regression analysis. Previous studies are drawn upon in constructing an economic model to explain factors that influence organic dairy farm profitability.

4.2.1 Farm Characteristics

Farm and herd size are expected to positively affect profitability. Tzouvelekas, Pantzios, and Fotopoulos (2001) found farm size had significant power in explaining variation in economic efficiency of organic cotton farms in Greece. Paul, Nehring, and Banker (2004) found that farm size has significant impact on the productivity and efficiency of U.S. livestock farms. El-Osta and Johnson (1998) found herd size to be the most significant contributing factor to net farm income among U.S. dairy farms. Mishra and Morehart (2001), Short (2000), and McBride and Greene (2007) also found that farm size had a significant, positive impact on the financial success of U.S. dairy farms. Furthermore, Gardebroek (2002) found that in the Netherlands farm size explains significant variation in the choice to farm organically, highlighting the importance the acreage base plays in organic dairy management.

Neely and Escalante (2006) found that larger U.S. organic farms, vegetable producers in particular, tend to hire more off-farm labor with regional variation. This may be especially true for organic farmers striving to facilitate natural biological cycles. Short (2000) found that U.S. dairy farms with low profitability hired more labor than those with high profitability. Small organic dairy farms are expected to rely more on unpaid family labor than larger organic dairy farms. Thus, small organic dairy farms are expected to receive lower levels of Net Income (NI) because NI equals revenues minus expenses including taxes and the opportunity costs of unpaid labor and management. It is hypothesized that size will positively impact NI as larger farms incur lower levels of opportunity costs for unpaid labor and management.

4.2.2 Extra Income

The ideal organic farm model is one that incorporates all levels of the farm, the soil, the plants, the animals, and the human, in a holistic manner. Therefore, one might expect to find less specialization and more diversification on an organic dairy farm. For example, organic pork, poultry, or crops may be produced in addition to organic milk, and such diversification may contribute supplemental income to the operation. Mishra and Morehart (2001) found that diversification was negatively correlated with dairy farm profitability. The detraction from specialization, they suggest, had a negative impact on conventional U.S. dairy farm profitability. However, since diversity is central to the organic ideal, extra income, after controlling for cost and production efficiency, is hypothesized to have a positive influence on organic dairy farm profitability.

4.2.3 Farm Operator Characteristics

Previous research suggests organic farmers face a steep learning curve, as they learn to manage a new technology. Sipilainen and Lansink (2005) found a significant learning effect in analyzing the efficiency of organic versus conventional dairy farms in Finland, estimating roughly seven years as the inflection point. Kreigl (2006) found that in Wisconsin organic dairy farms tend to be more financially successful than their conventional counterparts. The amount of experience within the sample of Wisconsin organic dairy farmers ranged from at least six to roughly twenty-five years of farming experience. Half the sample had been receiving organic milk prices for eight years and the other half for at least three years (Kreigl 2006). Kriegl (2006) notes, “The Wisconsin organic dairy farms that shared financial data were a fairly experienced group. [...] It is likely that a less experienced group would not perform as well as the group that shared data” (p. 1). However, McBride and Greene (2007) found that dairying experience had a positive impact on the costs of organic dairy farms in the U.S. which would be associated with decreased profitability. Nonetheless, it is expected that as managerial expertise evolves, efficiency increases, economies of scope are gained, and a farm enterprise may operate closer to maximum profitability given his/her own production constraint. Experience is, thus, hypothesized to have a positive impact on profitability.

An operator's age may influence the way he/she manages the farm operation. An older operator, for example, may have a different goal set than a younger operator and, thus, make different investments, management decisions, or be less likely to adopt newer technologies. El-Osta and Johnson (1998) found that age was negatively correlated with profitability among U.S. dairy farms. McBride and Greene (2007) found that age was positively correlated with the costs of U.S. dairy farms. Thus, age is hypothesized to have a negative impact on profitability.

Education is a variable that falls underneath the umbrella of managerial expertise. Tzouvelekas, Pantzios, and Fotopoulos (2001) found that farmer's age and education have significant power in explaining variation in economic efficiency of organic cotton farms in Greece. McBride and Greene (2007) found that primary organic dairy farm operators with less than a high school diploma were associated with lower economic costs. Mishra and Morehart (2001) found that farmer's education and use of cooperative extension agents had a significant and positive impact on financial success of U.S. dairy farms. Gardebroek (2002) found that education, as well as farm size, explains significant variation in the choice to farm organically in the Netherlands. Education is hypothesized to have a positive impact on profitability.

4.2.4 Technology

Integrating new technology into a dairy enterprise may offer several advantages. A milking system with automatic takeoffs, for example, may facilitate increased milk production without requiring additional labor, or it may simply free labor for other tasks. A milking system with udder washers may ensure cleaner milk and, thus, better milk prices. In addition, the milking system in general may vary in its level of technological advancement according to an operator's individual or regional requirements. Short (2000) found that those farms utilizing milking systems with automatic takeoffs and udder washers tended to be more profitable than others. El-Osta and Johnson (1998) found that more advanced milking parlors were positively correlated with U.S. dairy farm profitability. Therefore, technology measures are hypothesized to have a positive impact on profitability.

4.2.5 Efficiency Measures

In light of the restructuring and the trend toward consolidation that has been taking place within the dairy industry for the past several decades, experts believe that those dairy farms that are able to produce more efficiently will be more likely to survive than others (Bailey 2002; Mulhollem 2006). El-Osta and Johnson (1989) found that lower levels of purchased feed per cow had a positive impact on profitability among U.S. conventional dairy farms. Short (2000) found that more profitable U.S. dairy farms produced more milk per cow than less profitable dairy farms, required less feed per unit of milk sold, used less labor hours per cow, and had lower variable costs. Thus, production per cow is expected to be positively correlated with profitability, and variable costs and labor hours per cow are hypothesized to have a negative correlation with profitability.

4.2.6 Risk Management

Agricultural production is an inherently risky business, and managing risk is an important task for farm operators. Flaten and Lien (2005), however, found that risk aversion among Norwegian organic dairy farmers failed to explain variability in management of the resource base. Lien et al. (2003) found that Dutch organic dairy farmers tended to be less risk averse than conventional dairy farmers and expressed a different goal set. For example, organic dairy farmers were most concerned with forage yield uncertainty and valued sustainability and environment first and maximizing profitability last among their collective goal set (Lien et al. 2005). These studies highlight the impact of uncertainty, an important factor in an inherently risky industry, on financial performance. These studies suggest organic farmers tend to be less risk averse. Intuitively, it might be expected that adopters of a non-conventional technology are less risk averse than their conventional counterparts.

Nonetheless, risk management strategies can still be effective tools for stabilizing revenues and expenses and maximizing income. For example, farm operators may manage risk by employing different production and/or marketing strategies (Short 2000). Mishra and Morehart (2001) found that forward contracting of inputs has a significant, positive impact on financial success of U.S. dairy farms. Paul, Nehring, and Banker (2004) found that contracting inputs and/or outputs has a modest, but significant, impact on the productivity and efficiency of U.S. livestock farms. Furthermore, Short (2000) found that successful U.S. dairy farms tend to employ marketing strategies, such as spreading sales over the course of the year, contracting, and participating in cooperatives. The use of marketing and/or production strategies is expected to positively affect profitability.

4.2.7 Financial Efficiency

Investing in the dairy farm enterprise, such as new technology, for example, often requires large amounts of borrowed capital which must be repaid with interest as the asset depreciates over the lifespan of the debt instrument. Bailey (2002) warns that not all investments are right for all farms, and that each individual farm must thoughtfully manage its investments according to the individual objective and debt carrying capacity of the enterprise. El-Osta and Johnson (1998) and Short (2000) found that the debt-to-asset ratio of the farm had a negative impact on U.S. dairy farm profitability. Thus, it is hypothesized that the debt-to-asset ratio will have a negative correlation with organic dairy farm profitability in the Northeast.

4.3 Empirical Model

The objective here is to try to explain the factors that determine profitability across organic dairy farms in the Northeast. Profitability, measured by three types of measurements, NFIFO, NFI and NI, is modeled as a function of input/output prices and a production constraint, which is dependent upon farm and farm operator characteristics. The conceptual model borrows heavily from McBride and Greene (2007), Mishra and Morehart (2001), El-Osta and Johnson (1998), and Short (2000).

Assume that the following profit function represents a profit-maximizing, price-taking firm.

$$\pi(P_1, P_m, \kappa, \delta) = \sum P_1 Q_1(P_1, \kappa, \delta) - \sum TC_m(P_m, Q_m, \eta, \gamma), \tag{1}$$

where $\mathbf{P_l}$ is a vector of output prices, $\mathbf{Q_l}$ is a vector of quantities of various outputs produced, $\boldsymbol{\kappa}$ is a vector of farm operator characteristics, δ is a vector of farm characteristics, $\mathbf{TC_m}$ is a vector of costs, $\mathbf{P_m}$ is a vector of input prices, $\mathbf{Q_m}$ is a vector of inputs, η is a vector of farm operator characteristics, γ is a vector of farm characteristics.

Transformation of the economic model in Equation (1) yields an econometric model as follows:

$$\pi = \alpha_0 + \alpha_1 \mathbf{X}_1 + \alpha_2 \mathbf{X}_2 + \alpha_3 \mathbf{X}_3 + \alpha_4 \mathbf{X}_4 + \alpha_5 \mathbf{X}_5 + \alpha_6 \mathbf{X}_6 + \alpha_7 \mathbf{X}_7 + \varepsilon, \tag{2}$$

where $\mathbf{X}_1$ is a vector of farm characteristics, $\mathbf{X}_2$ is a vector of extra income variables, $\mathbf{X}_3$ is a vector of farm operator characteristics, $\mathbf{X}_4$ is a vector of technology indicators, $\mathbf{X}_5$ is a vector of efficiency measures, $\mathbf{X}_6$ is a vector of risk management measures, and $\mathbf{X}_7$ is a financial efficiency measure. In the regression model, NFIFO, NFI, and NI are substituted for π. Thus, organic dairy farm profitability is hypothesized to be a function of output/input prices, farm characteristics, extra income, farm operator characteristics, technology, efficiency measures, risk management decisions, and financial efficiency. Assuming a competitive market for input and output, all organic dairy farms are assumed to be price takers. In addition, it is assumed that all dairy farms face the same input market conditions. Table 1 lists the explanatory variables of the model, their definitions, and their expected signs. Descriptive statistics of these variables are in Table 2.

4.4 Data

Data used in this analysis come from the 2005 Agricultural Resource Management Survey (ARMS) of U.S. dairy farms conducted by the Economic Research Service (ERS) and the National Agricultural Statistics Service (NASS) of the United States Department of Agriculture (USDA). The ARMS survey is a multiframe, probability-based survey, and it is designed to collect detailed financial data about farm financial performance (USDA 2007). The financial data can be used to construct various measures of financial performance, such as profitability, liquidity, and solvency. The survey also collects data on farm operator and farm characteristics, as well as various production management decisions.

The ARMS data used here represent a targeted sample of U.S. milk producers from 24 states, which comprise over 90 percent of total U.S. milk production, as well as a sub-sample of certified organic milk producers from 19 states nationwide (McBride and Greene 2007). The data are weighted according to their probability of occurring, which is based on certain farm characteristics and a known number of farms with those similar characteristics (Short 2000). The stratified sample and the subsequent probability-weighted data allow each farm to represent several similar farms and adjust for the over-sampled, organic population. The USDA provides further details online (USDA 2007).

This study is focused on the Northeast region of the U.S. which is represented by Pennsylvania, New York, Vermont, and Maine. There were 278 conventional dairy farms and 152 organic dairy farms from this Northeast dairy region. Mixed farms with both organic and conventional operations, as well as those dairy farms transitioning to organic status in 2005 were excluded from the analysis. After removing statistical outliers from the data set, there were 151 organic dairy farms used for analysis, of which 43 were observations from Pennsylvania, 49 were observations from New York, 38 were observations from Vermont, and 21 were observations from Maine.

4. Results and Discussions

5.1 Profitability of Organic Dairy Farms in the Northeast

Organic dairy farms tend to operate on significantly different size scales. As Table 3 shows, a typical organic dairy farm in the Northeast was operating on 318 acres in 2005, which is smaller than a typical conventional dairy farm (Postel, 2008). The average organic dairy farm sold 6,111 cwt of milk and the mean herd size for organic farms was 54 cows. A typical organic cow produced 119 cwt of milk, which was lower than conventional cows. However, the average milk price received by organic farms was $24/cwt (relative to $16/cwt for conventional milk); thus the organic milk price premium was roughly $8/cwt in 2005, or 50 percent higher than the conventional price. This suggests that, while size determines much of the difference in milk production, there may be other factors, such as the milk price, that may be contributing to the relative difference in profitability between these two groups.

On the cost side, organic farms typically use less purchased feed and use more homegrown feed, thereby reducing cost compared to conventional dairy farms. The average Northeast organic dairy farm had statistically significantly lower operating costs for all cost components from a per-farm perspective. For instance, conventional dairy farms faced purchased feed costs 5.6 times higher than organic farms (Postel, 2008). Cows on organic farms in the Northeast were producing for a greater number of years than cows on conventional farms, possibly reducing the cost of cow herd replacement (Postel, 2008). It is noteworthy that labor costs for organic farms, which are often associated with increased labor-intensiveness, especially concerning milk production, comprise a smaller percent of total operating expenses (6 percent) than for conventional farms (12 percent).

The three most important income components for the organic group were milk sales, livestock and poultry sales, and non-money farm income[2], which make up 96 percent of a typical organic farm's revenues. In contrast to Dalton et al. (2005) findings, this study shows that the average organic dairy farm was profitable in 2005 (Table 4), earning a NFIFO of $47,356 and a NFI of $42,853 after taxes. However, mean NI was negative at $-3,761, that is, after withdrawals for unpaid labor and management were included. This means that organic dairy farms perhaps

[2] The USDA provides the following example of non-money farm income: "Nonmoney income, such as the imputed rental value of a farm-owned dwelling, represents a business contribution to the household income because it frees up household cash that would otherwise be spent on housing" (USDA, 1995, p. 64).

did not realize positive returns to unpaid family labor and management in the Northeast in 2005.

From a per-CWT EQ perspective (Table 3, Column 3), on average, organic dairy farms in the Northeast earned $10,781 per CWT EQ in gross revenue. Total operating expenses of a typical or average organic dairy farm was $7,928/CWT EQ, which was significantly lower than a typical conventional dairy farms in the region (Postel, 2008). Thus, considering the average organic milk price premium of $8.30/CWT (2005 level), the oft stated question emerges: is the organic price premium, coupled with a lower level of expenses, enough to outweigh the lower levels of productivity and revenues associated with the relative smallness of the organic ideal? This study found that, at the farm-level, the average organic dairy farm was profitable in the Northeast region, but did not necessarily earn positive returns to unpaid labor and management.

The average northeast organic dairy farm was profitable in 2005 earning a NFIFO/CWT EQ of $2,853 and a NFI/CWT EQ of $2,582 after taxes. This finding is in contrast to Dalton et al. (2005) but in accord with Butler (2002) and Kriegl (2006). However, NI/CWT EQ becomes negative at $-227, that is, after withdrawals for unpaid labor and management are included. This compares to a mean NFIFO/CWT EQ of $8,616, NFI/CWT EQ of $7,775, and NI of $3,304 per hundredweight equivalent on conventional dairy farms.

5.2 Factors Determining Organic Dairy Farm Profitability

This section presents the factors that impact the profitability of organic dairy farms in the Northeast. A multiple regression analysis was carried out using a weighted least squares regression procedure and Table 5 presents the regression results. Three models of profitability are presented using the three dependent variables, NFIFO (Model 1), NFI (Model 2), and NI (Model 3). The variable definitions were presented in an earlier section, and are not repeated here. The overall model's significance was 12.66 for Model 1, 12.22 for Model 2, and 12.91 for Model 3 (Table 5). In terms of explanation of variability, 73.17 percent of variability in Model 1 was explained by the regressors, 72.41 percent in Model 2, and 73.60 percent in Model 3 (Table 5).

Economic theory dictates two possible ways of increasing profitability in the short run holding the price of inputs, output and other variables constant: (1) reduce variable costs of production, that is, produce more efficiently, or (2) increase the volume of production (FFSC

1997). This study finds that, while variable expenses and scale of production explain much of the variation in profitability, there are additional characteristics that influence organic dairy farm profitability in the Northeast.

5.2.1 Farm Characteristics

The organic milk price received varied considerably within a range of $15.85/cwt to $31.58/cwt (Table 2). Receiving a higher organic milk price, ceteris paribus, was expected to increase profitability. The results show that the average organic milk price (AVEPRICE) received had a significantly positive impact on NFIFO (Table 5).

Farm size has consistently been shown to positively impact financial performance (MacDonald et al. 2007; Mishra and Morehart 2001; Short 2000). This study found that the number of milk cows (MILKCOWS) had a positive impact on NFIFO (Table 5). An additional organic milk cow typically added 119cwt of milk to annual production (Table 3). Thus, at an average organic milk price received of $24/cwt (Table 2), an additional cow added roughly $2,856 in milk revenues to the typical organic dairy farm in the Northeast in 2005.

The average age of the milking herd (COWAGE) was hypothesized to have a negative impact on profitability. As cows age, their productivity may decline. The results show that cow age had a negative impact on NFIFO, NFI, and NI.

Family farms were expected to have lower levels of NI than other types of farms (partnerships and corporations) since NI accounts for the opportunity costs of unpaid labor. This study found that in terms of legal status (LEGSTAT) of organic dairy farms in the Northeast, sole proprietorship (family farm) was negatively correlated with NFIFO, NFI, and NI. Similar findings were made by Mishra and Morehart (2001). Though family farms may enjoy the benefit of unpaid family labor, family members may not always be available to work on the farm. Spouses, for example, often work off-farm to provide supplemental income to the household[3]. With fewer family members available to work on the farm, there may be less of an opportunity for the specialization of expertise and the economic benefits associated with achieving economies of scope.

Longer hours of operating the milking system was expected to contribute to increased milk production. Short (2000) found that longer hours of operation was associated with greater

[3] It should be noted that off-farm income was not included in the calculation of NFIFO, NFI, and NI.

NFI. Thus, it was hypothesized to have a positive impact on profitability. The hours per day that the milk enterprise was in operation (HRSMLKON), however, had a statistically significant and negative impact on NI (Table 5), but it was insignificant in explaining the variations in NFIFO and NFI (Table 5). Operating the milking system for longer hours likely requires more labor. Considering the majority of the organic dairy farms in the Northeast are family farms, much of the labor is probably unpaid. While NFIFO and NFI do not account for the opportunity cost of this unpaid labor, NI does account for this opportunity cost. Thus, longer operating hours likely increased the opportunity cost for unpaid labor and decreased NI.

On the other hand, taking milk cows out of production on a seasonal basis was likely to decrease milk production. The choice to dry off cows seasonally was expected to negatively impact NFIFO. This study found that the choice to dry off milk cows seasonally (DRYOFF) negatively influenced NFIFO (Table 5). These findings suggest the importance of finding an optimal level of production intensity.

Management Intensive Rotational Grazing (MIRG) requires more than simply allowing cows to roam freely on pasture. Managing pasture and rotations requires skill, time, energy and inputs, but rotational grazing is supposed to rely less on external inputs (Shiere et al. 2002), therefore, possibly reducing variable costs. Thus, MIRG was hypothesized to have a positive affect on NFIFO. However, rotational grazing was found to be insignificant in explaining the variation in profitability.

5.2.2 Extra Income

Organic dairy farms in this sample primarily produced milk. However, there were other sources of revenue that contributed to NFIFO, NFI, and to a lesser degree, NI. It was expected that revenues from non-milk sales would contribute to profitability in a positive way. The additional revenues generated, however, may not be enough to offset the costs, and there may be implicit costs associated with reducing the specialization of the dairy enterprise. Nonetheless, livestock and poultry sales, crop sales and the receipt of government payments were expected to have a positive impact on profitability. The results show that livestock and poultry sales (LPSXMLKS) and crop sales (CSCCC) both had a positive influence on NFIFO, NFI, and NI (Table 5). Receiving government payments (GOVTYES), however, was negatively correlated with profitability (Table 5).

5.2.3 Farm Operator Characteristics

Farm operators bring different skill sets to each individual enterprise that may be captured by various operator characteristics. As a farm operator's age increases, knowledge and expertise is likely to increase. However, as a farm operator's age increases, his/her management decisions may change based on the future expectations of the dairy operation. The age of the primary operator has been found to be associated with higher operating costs (McBride and Greene 2007), and lower NFI (El Osta and Johnson 1998). After controlling for experience, farm operator's age was hypothesized to negatively impact profitability. The results show, however, that age (OPEAGE) had a significant and positive impact on NI, and it was insignificant in explaining NFIFO and NFI.

Higher education of dairy operators has been found to be correlated with higher levels of profitability (Mishra and Morehart 2001). Mishra and Morehart (2001) suggest that education may measure one's ability to process new and complex information, a presumably important characteristic for organic dairy farmers learning to manage a new technology within a new set of rules and regulations. Primary operator's education (OPEDU) was expected to have a positive impact on profitability. The results show, however, that education was not significant in explaining the variation in NFIFO (Table 5). These findings are in line with those by Short (2000) and El-Osta and Johnson (1998) focusing on U.S. dairy farmers in general.

Experiential knowledge in contrast to or in addition to education can facilitate the development of managerial expertise that perhaps can only be acquired on the farm. Dairy farming experience, therefore, was expected to have a positive impact on NFIFO. However, this study found that dairy farming experience (MLKEXP) did not have any impact of organic dairy farm profitability. Short (2000) also found that dairy farming experience was insignificant in explaining profitability among U.S. dairy farms.

It was hypothesized that the longer an organic dairy farmer expected to continue the current operation (FUTURE), the greater the level of NFIFO, NFI, and NI would be. This is because a primary operator's expectations about the future of the dairy enterprise may affect certain management decisions that subsequently may have a positive impact on performance. It was found that future expectations (FUTURE) were statistically significant with a positive coefficient in all three models.

5.2.4 Technology

Integrating new technology into the organic dairy production model was hypothesized to have a significant and positive impact on profitability. New technologies may lead to increased efficiencies. Technological tools may free labor for other tasks; thus increasing specialization. Moreover, technology adoption has been found to have a positive impact on dairy farm financial performance (El Osta and Johnson 1998; Short 2000).

The majority of milking facilities (i.e., technology) used on organic dairy farms in the Northeast were some variation of a parlor, usually barns with pipelines. However, there were farms utilizing pail and bucket units as well. The variable PARLOR captured those farms primarily utilizing some type of parlor and the pail and bucket units represented the rest. The variables, AUTTAKOF and UDDRWASH, captured those farms that had milking systems with automatic takeoffs and udder washers, respectively. El-Osta and Johnson (1989) found that more advanced milking facilities were positively correlated with profitability and economic performance. Short (2000) found that dairy farms with higher profitability were more likely to have milking equipment with automatic takeoffs and udder washers; thus these three variables were used as measures of technology adoption.

All three technology measures, PARLOR, AUTTAKOF, and PARLOR were hypothesized to have a positive impact on profitability. The results show that AUTTAKOF was the only variable of significance. However, it had a statistically significant and negative impact on NI and no significant impact on NFIFO and NFI. This finding is in contrast to Short (2000) findings and could be explained as follows: it is possible that acquiring new technological equipment can be costly and increase financial stress. Greater debt loads would lead to increased interest payments and depreciation expenses and decreased profitability, which may have been the case in this sample.

5.2.5 Efficiency Measures

Both production and cost efficiency measures were used to capture the variation in profit due to production and cost efficiencies. Milk production per cow (MLKPRDCW) was used as a measure of production efficiency and total variable costs per cow (TVCCOW) was used as a measure of cost efficiency. Short (2000) found that higher NFI farms typically had greater levels of milk production per cow and lower levels of total variable expenses. El-Osta and Johnson (1989) found that greater milk sold per cow was correlated with dairy farm economic performance.

Greater levels of milk production per cow were expected to positively impact profitability, while greater total variable costs per cow were expected to have a significant and negative impact on profitability. In line with expectations, the results show that milk production per cow (MLKPRDCW) was significant and had a positive coefficient in all three models, and TVCCOW was significant and had a negative impact on NFIFO, NFI, and NI.

5.3.6 Risk Management

Farm operators used different mechanisms to manage the risk associated with fluctuations in the prices of inputs and output, and the risk involved with ensuring a market for their product. Various risk management strategies have been found to increase profitability (Mishra and Morehart 2001). Negotiating input price discounts (PDISCOUNT), or locking in low input prices via forward contracts (PINPUTLCK), and locking in favorable milk prices via forward contracts (FWARDCON) were expected to have a positive impact on profitability (Table 5). These risk management tools, however, were insignificant in explaining the variation in profitability among organic dairy farms in the Northeast.

5.3.7 Financial Efficiency

Agriculture is an inherently risky business. Managing that risk to minimize its impact on the farm business was expected to be important in determining profitability. The debt-to-asset ratio measures the proportion of farm assets owned by creditors, or the risk exposure of a farm business (FFSC 1997, Sec. 3, p. 9). Greater levels of risk exposure were expected to have a negative impact on profitability. The results show that the debt-to-asset ratio (DEBT2ASST) had a significantly negative impact on profitability in all three models (Table 5). This finding is in accord with Short (2000) and El-Osta and Johnson (1989), who found that higher debt-to-asset ratios were negatively correlated with profitability.

6. Conclusions

The purpose of this study was to identify and analyze factors affecting organic dairy farm profitability in the Northeast United States. This study utilized a unique data set of farm financials, farm characteristics, and farm operator characteristics from the USDA's 2005 dairy farm ARMS survey. We found that the typical organic farm was profitable in 2005, earning a positive NFIFO and NFI. However, NI was typically negative, meaning that organic dairy farms typically did not earn positive returns to unpaid management and labor. The relative importance of each profitability measure used in this study, NFIFO, NFI, and NI, ultimately depends upon the subjective interpretation of the primary stakeholder, the dairy farmer. Diversification was important for the organic dairy farms. Dairy farms in the Northeast received significant revenues from livestock and poultry sales, and crop sales.

In general, organic farms incurred lower levels of total operating expenses. Expensive organic feed is often targeted as a significant impediment to profitability, and primary operators reported the high cost of organic feed as one of the most difficult aspects of organic dairy farming. In accord with Butler (2002), organic dairy farms in the Northeast typically substituted homegrown feed and pasture for expensive feed and concentrates.

An examination of the factors influencing financial performance of organic dairy farms in the region showed that the average milk price received, the number of milk cows, and extra income from livestock, poultry, and crop sales had a significantly positive impact on the profitability of organic dairy farms in the Northeast. In addition, the number of years the dairy enterprise was expected to continue operating had a significant and positive impact on profitability. An operator's positive expectations regarding the future of the dairy operation may have had an impact on how the enterprise was managed in 2005.

Not surprisingly, farms that were operating more efficiently were more profitable. Managing total variable costs and increasing production per cow was significant in explaining variability in profitability. In addition, farms that managed their level of debt exposure were more likely to be profitable than others. The debt-to-asset ratio measures the proportion of assets owned by creditors, and it had a significant and negative impact on profitability. It was found that unprofitable organic dairy farms had higher levels of depreciation on farm assets and interest payments which might be associated with debt levels.

The hours per day that the milking system was in operation was found to have a negative correlation with NI, however, it did not impact NFIFO or NFI. This finding contradicts expectations. The negative impact on NI might be expected because NI accounts for the opportunity costs of unpaid labor and management. As the majority of organic dairy farms in the Northeast are family farms, longer labor hours required to run a milking system for a longer time were probably draw from unpaid family labor.

The use of automatic takeoffs had a negative impact on NI, but it was not significant in explaining variability in NFIFO or NFI. Automatic takeoffs probably represented an expensive investment that led to increased depreciation and interest expenses. Furthermore, milking technology designed to increase the productivity or efficiency of the milking operation may be less suitable to the organic model.

This study analyzes the impact that farm and farm operator characteristics had on the profitability of organic dairy farms in the Northeast. In terms of NFIFO and NFI, it was found that larger organic dairy farms that were able to produce more efficiently and keep debt levels down were more likely to be profitable. Additionally, in terms of NI, the level of dependence upon unpaid family labor and management was significant in determining the returns to unpaid management and labor among organic dairy farms in the Northeast.

This study's findings have important and useful implications for various stakeholders within the organic dairy sector. This information is useful to conventional dairy farms in the Northeast that are struggling to survive and may by contemplating transitioning to organic status. On the same thread, this study is valuable to the extension agents in the region, who may be advising those small dairy farms previously mentioned, as well as other organizations that support organic agriculture in the region, such as the Northeast Organic Farming Association (NOFA).

In terms of the shortcomings of this study, it is limited in that in utilizes cross-sectional data that represent only one year of dairy farming performance. Political and environmental factors, and the organic milk price premium may vary over time and, thus, could alter the findings of such a study in the near future. Additionally, profitability is only one measure of financial performance. Future studies of this kind may want to address measures of liquidity, solvency, or operational ratios. Finally, this study does not address the cost of transitioning to organic status, which can be significant. Additionally, this study does not account for those mixed farming operations that produce both organic and conventional agricultural products within the same operation. These types of dairy farms would add information and nuances to a study of this kind.

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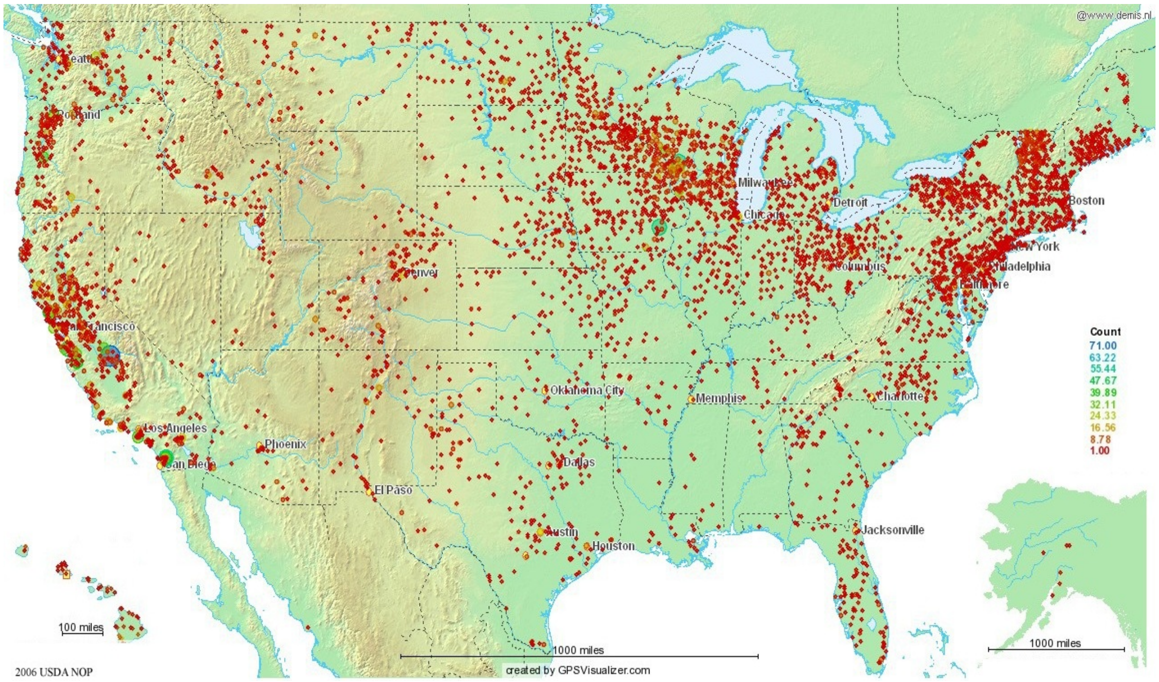
Figure 1: Distribution of U.S. Certified Organic Operations in 2006



Source: Organic Farming Research Foundation (2006)

Table 1: List of Regressors, their Definitions and Expected Signs

Variable	Definition	Expected Sign
Farm Characteristics:		
AVEPRICE	Average milk price received	+
MILKCOWS	Number of milk cows	+
ACGFEED	Acres of grazing pasture	+
MIRG	Management intensive rotational grazing	+
COWAGE	Average age of the milking herd	-
LEGSTAT	Family farm / Sole proprietorship	+
HRSMLKON	Hours per day milking system in operation	+
SILOCAP	Capacity of milk tanks and silos	+
DRYOFF	Choice to dry off cows seasonally	-
NUTMNPLN	Use of a nutrition management plan	+
VETSERVIC	Use of regularly scheduled veterinary Services	+
Extra Income:		
LPSXMLKS	Livestock and poultry sales (excludes milk sales)	+
CSCCC	Crops sales net CCC loans	+
GOVTYES	Receive government payments	+
Farm Operator Characteristics:		
OPEAGE	Operator's age	-
OPEEDU	Operator's highest level of education	+
MILKEXP	Years dairy farm has been in operation	+
MIRGEXP	Years practicing rotational grazing	+
FUTURE	Years operator expects to continue operation	+
Technology:		
PARLOR	Milking parlor used on operation	+
AUTTAKOF	Milking system with automatic takeoffs	+
Efficiency Measures:		
MLKPRDCW	Milk production per cow	+
PFEEDCOW	Purchased feed per cow	-
HFEEDCOW	Homegrown feed per cow	+
LABCOW	Labor costs per cow	-
LABHRCOW	Labor hours per cow (paid and unpaid)	+
CULLRATE	Cow loss rate	-
Risk Management:		
PDISCOUNT	Negotiate input price discounts	+
WRITTCON	Have a written contract for marketing milk	+

ONSITPRO	Processed milk on site	-
Financial Efficiency:		
DEBT2ASST	Debt/Asset ratio	-

Table 2: Summary Statistics of Explanatory Variables, n=141

Variable	Unit	Mean	Std. Dev.	Min.	Max.
Farm Characteristics:					
AVEPRICE	$/cwt	24.00	2.19	15.84	31.58
MILKCOWS	Number	53.07	22.89	16.00	190.00
ACGFEED	Acres	95.51	78.66	6.00	400.00
MIRG	Yes/No	Yes*	0.39	0.00	1.00
COWAGE	Years	5.15	1.25	2.00	10.00
LEGSTAT	Yes/No	Yes*	0.24	0.00	1.00
HRSMLKON	Hours	3.64	1.53	1.00	12.00
SILOCAP	Gallons	928.41	801.57	200.00	8,000.00
DRYOFF	Yes/No	No*	0.33	0.00	1.00
NUTMNPLN	Yes/No	No*	0.48	0.00	1.00
VETSERVIC	Yes/No	No*	0.48	0.00	1.00
Extra Income:					
LPSXMLKS	$	10,130.06	11,297.45	0.00	74,484.00
CSCCC	$	1,976.30	12,066.39	-6,068.00	139,749.00
GOVTYES	Yes/No	Yes*	0.49	0.00	1.00
Farm Operator Characteristics:					
OPEAGE	Years	48.05	11.38	25.00	82.00
OPEEDU	Scale	2*	0.39	0.00	1.00
MILKEXP	Years	20.57	13.63	2.00	75.00
FUTURE	Scale	6*	1.24	1.00	6.00
Technology:					
PARLOR	Yes/No	No	0.43	0.00	1.00
AUTTAKOF	Yes/No	No	0.34	0.00	1.00
UDDRWASH	Yes/No	No	0.14	0.00	1.00
Efficiency Measures:					
MLKPRDCW	CWT	119.14	38.32	40.00	195.33
HFEEDCOW	CWT	131.08	106.65	0.00	1.00
LABHRCOW	Hours	10.44	5.59	2.20	48.75
CULLRATE	Ratio	0.04	0.03	0.00	0.15
TVCCOW	$	1,978	1,148	313.70	11,186
Risk Management:					
PDISCOUNT	Yes/No	No	0.47	0.00	1.00
WRITTCON	Yes/No	Yes	0.38	0.00	1.00
ONSITPRO	Yes/No	No	0.18	0.00	1.00
Financial Efficiency:					

DEBT2ASST	$	0.16	0.19	0.00	1.02

Note: * denotes use of mode.
Source: authors' computation from the ARMS data

Table 3: Farm Characteristics of Organic Dairy Farms in the Northeast

Farm Characteristic	**Organic** *n=151*
Average milk price ($/cwt)	24
Total acres	318
Total milk sold (cwt)	6,111
Number of milk cows	53
Milk sold (cwt) per cow	119
Feed (cwt) per milk sold (cwt)	8.9
Purchased feed (cwt) per cow	842
Homegrown feed (cwt) per cow	130
Purchased feed (cwt) per milk produced (cwt)	6.21
Homegrown feed (cwt) per milk produced (cwt)	1.23
Total farm labor hours worked per week per cow	10.5
Total farm labor hours worked per week per cwt	0.1
Average age of the milking herd	5.1
Milk cow loss per cow (%)	3.7
Acres of pasture per cow	1.35
Months/Year on pasture	7

Source: authors' computation from the ARMS data

Table 4: Income Statement of Organic Dairy Farms in the Northeast U.S., 2005

Attributes	Per Farm	Per CWT EQ
	n=151	*n=151*
REVENUES		
Milk Sales	146,316	8,814
Livestock & Poultry Sales	9,978	601
Net Change in Value of Livestock & Poultry	-64	-4
Livestock Breeding Stock Cash Sales	2,150	130
Gain/Loss Livestock Breeding Stock	129	8
Crop Sales Net CCC Loans	1,914	115
Net Change in Value of Crops	-332	-20
Government Payments	4,406	265
Income from Custom Work	344	21
Other Farm Related Income	8,819	531
Income from Livestock Related Operations	273	16
Non-Money Farm Income	9,841	593
Net Change in Accounts Receivable	-4,810	-290
Gross Revenues from Farming Operations, Accrual Adjusted	***178,964***	***10,781***
EXPENSES		
Purchased Feed	41,150	2,479
Purchased Livestock	467	28
Other Livestock Related Expenses	4,021	242
Labor	11,049	666
Fertilizer & Chemicals	2,615	158
Seeds & Plants	1,453	88
Fuel & Oil	6,213	374
Equipment & Vehicle Maintenance	7,474	450
Infrastructure Maintenance	3,945	238
Other Variable Expenses	9,973	601
Custom Work	3,378	204
Utilities	4,558	275
Insurance	2,856	172
Rent Leasing Land	2,651	160
Net Change in Value of Supplies	355	21
Depreciation on Farm Assets	18,449	1,111
Total Interest	8,228	496
Interest, Accrual Adjusted	3,482	210
Total Operating Expenses, Accrual Adjusted	***131,608***	***7,928***
Net Farm Income from Farming Operations, Accrual Adjusted (NFIFO)	**47,356**	**2,853**
Real Estate & Property Taxes	4,503	271
Net Farm Income (NFI)	**42,853**	**2,582**
Withdrawals for Unpaid Labor & Management	46,613	2,808
Net Income (NI)	**-3,761**	**-227**

Source: authors' computation from the ARMS data

Table 5: Factors Determining Organic Dairy Farm Profitability in the Northeast U.S., 2005 (n=141)

Variable	Expected Sign	Model 1 NFIFO		Model 2 NFI		Model 3 NI	
		Coefficient	*p-value*	*Coefficient*	*p-value*	*Coefficient*	*p-value*
Farm Characteristics							
AVEPRICE	+	6,123.66***	(<0.001)	6,131.13***	(<0.001)	6,191,06***	(<0.001)
MILKCOWS	+	1,233.45***	(<0.001)	1,179.08***	(<0.001)	959.80***	(<0.001)
ACGFEED	-	32.51	(0.447)	33.20	(0.442)	27.80	(0.520)
MIRG	+	8,574.49	(0.352)	8,116.50	(0.383)	5,719.08	(0.538)
COWAGE	-	-7,956.27***	(0.006)	- 8,148.28***	(0.005)	-11,411.00***	(<0.001)
LEGSTAT	-	-29,964**	(0.022)	-29,982**	(0.023)	-37,083***	(0.005)
HRSMLKON	+	-2,567.24	(0.278)	-2,152.37	(0.367)	-4,425.19*	(0.065)
SILOCAP	+	6.99	(0.119)	6.83	(0.131)	6.53	(0.149)
DRYOFF	-	-29,749**	(0.013)	-29,722**	(0.014)	-26,466.00**	(0.028)
NUTMNPLN	+	-872.98	(0.913)	-776.35	(0.923)	-4,314.626	(0.592)
VETSERVIC	+	2,297.43	(0.767)	2,786.69	(0.722)	3,651.27	(0.642)
Extra Income							
LPSXMLKS	+	1.38***	(<0.001)	1.39***	(<0.001)	1.23***	(0.001)
CSCCC	+	1.58***	(<0.001)	1.59***	(<0.001)	1.56***	(<0.001)
GOVTYES	+	-14,518	(0.149)	-13,745	(0.18)	-12,637.00	(0.213)
Farm Operator Characteristics							

OPEAGE	-	674.09	(0.119)	651.12	(0.137)	841.66*	(0.055)
OPEEDU	+	-1,633.48	(0.779)	-1,305.46	(0.825)	-3,236.16	(0.584)
MILKEXP	+	-260.21	(0.363)	-264.11	(0.361)	-231.51	(0.423)
FUTURE	+	7,305.08**	(0.031)	7,592.00**	(0.026)	7,614.57**	(0.026)
Technology							
PARLOR	+	5,171.24	(0.625)	6,637.63	(0.535)	7,674.27	(0.474)
AUTTAKOF	+	-16,545.00	(0.121)	-15,250.00	(0.157)	- 22,084.00**	(0.042)
UDDRWASH	+	-22,825.00	(0.256)	-23,792.00	(0.241)	-13,100.00	(0.518)
Efficiency Measures							
MLKPRDCW	+	1,013.21***	(<0.001)	998.632***	(<0.001)	917.45***	(<0.001)
HFEEDCOW	+	-32.49	(0.315)	-31.80	(0.330)	-48.65	(0.137)
LABHRCOW	+	-317.52	(0.703)	-296.801	(0.724)	-1,067.20	(0.206)
CULLRATE	-	53,620.00	(0.655)	37,758.00	(0.755)	118,790.00	(0.328)
TVCCOW	-	-0.78***	(<0.001)	-0.785***	(<0.001)	-0.807***	(<0.001)
Risk Management							
PINPUTLCK	+	3,511.71	(0.816)	2,196.83	(0.886)	3,981.94	(0.794)
PDISCOUNT	+	-6,727.52	(0.464)	-7,313.08	(0.430)	-3,941.77	(0.671)
VOLPREM	+	5,426.72	(0.574)	5,927.64	(0.544)	15,509.00	(0.1143)
WRITTCON	+	14,202	(0.133)	14,371	(0.132)	11,811.00	(0.215)
FWARDCON	+	2,818.33	(0.771)	2,721.51	(0.781)	-1,045.82	(0.915)
ONSITPRO	+	-10,485	(0.697)	-11,482	(0.674)	-27,170	(0.320)

Financial Efficiency							
DEBT2ASST	-	**There are no sources in the current document.** -90,626***	(<0.001)	-86,947***	(<0.001)	-77,511.00***	(0.003)
Intercept		-207,425***	(<0.001)	-209,805***	(0.002)	-198,807***	(0.003)
F-stat		12.66***	(<0.001)	12.22***	(<0.001)	12.91***	(<0.001)
Adj. R^2		0.73		0.72		0.74	

Note: Values displayed are parameter estimates and corresponding p-values are in parentheses. Statistically significant means are as follows: *** p ≤ .01, ** p ≤ .05, * p ≤ .10