New York Dairy Farms' Adoption of Management Tactics During the 2009 Economic Slowdown

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Abstract

New York dairy farmers' adoption of management tactics to reduce the impacts from the economic downturn was studied using survey data collected from 101 dairy operations in 2009. A Canonical Discriminate Analysis was used and results indicate that managers who practice more management tactics tend to operate a larger herd, hold a leadership position in dairy organizations, and feel pressure from the adverse economy. Prevailing tactics dairy farms have practiced to lower production costs include: reduce feed spoilage (90%), control utility costs (89%), reducefeed protein and additives (72% and 71% respectively), and cull cows (67%). Farm managers who have small acreages and feel financial pressure have actively sought help from various agricultural assistance programs, whereas larger operations have not.

Keywords: New York dairy, Dairy management, Economic slowdown, Management tactics

1. Introduction

Family dairy farming is an important revenue generating activity in New York agriculture. Of the 5,683 dairy farms reporting production of dairy products, 76% are family owned (DiNapoli, 2010a). During the ongoing economic slowdown, a dramatic drop in milk price has negatively affected the financial viability of these family operations such that a loss of $700 million was reported for 2009 (DiNapoli, 2010b). In June 2009, farmers experienced an historical low milk price of $11.5 per hundred weight, down $7 from the previous year, which was too low to cover operating expenses of $17 per hundred weight (DiNapoli, 2010b). In the largest dairy farming community of Jefferson County, 10 out of 270 operation sannounced bankruptcy in January 2009, resulting in a $27 million loss of revenue for the county (DiNapoli, 2010b; Jefferson County Dairy Farms.Com). The loss of revenue from dairy farming had a ripple effect on other sectors in New York agriculture, negatively affecting the dairy feed industry, the animal drug industry, and the sales tax base of the state (DiNapoli, 2010b). Conversations in rural coffee shops, agricultural colleges, and state agricultural meetings revolved around a common question: what operational adjustments can dairy farms practice to ensure the survival of the state's dairy industry? Some still believe there are sufficient reasons to stay confident in New York dairy farming because the price of feed, gas, and fertilizer are dropping, which may predict a higher return for dairy (The Bovine, 2009). Others argue there is cause for concern because the 2007 and 2008 high returns were primarily a result of excessive international demand, which could not be satisfied by other dairy exporters due to unfavorable weather. Current production from other countries has since increased and overseas demand is low which may signal an onset of a broader recession in the U.S. dairy industry (DiNapoli, 2010b; Cessna, 2010).

It is undeniable that New York dairy farming is undergoing significant financial challenges and many farms are confronted with substantial economic difficulties. Even before the start of the economic slowdown, the dairy industry had already undergone significant structural changes and the number of dairy farms fell from 13,820 in 1997 to 5,683 in 2007, a 59% decrease (Dairy Statistics by State 2007, Wisconsin Department of Agriculture,

Trade and Consumer Protection). According to Tauer (2001) and Tauer and Mishra (2006), this reduction was almost exclusively the result of closing small dairy farms with fewer than 100 cows, and the closesures posed a heavy burden to society due tothe resultant negative environmental externalities and the disruption of rural landscapes. The economic downturn has mainly threatened the profitability of mid-size dairy farms who are not able to generate higher returns to offset the costs of production (Plume, 2009; Thraen 2010; MacDonald et al. 2007; Nehring et al. 2009). Studies show that production costs per hundredweight of milk fall by nearly one-half as herd size increases from fewer than 50 head to 500 or more head (Tauer, 2001). However, farms with fewer than 200 cows accounted for 96% of New York herds and 38% of the national inventory of cows (MacDonald et al. 2007; NEPC Grazing Guide, 2011). These smaller dairy farms are more vulnerable to the ongoing economic downturn and they have to frequently practice operational adjustments to achieve higher economic efficiency.

To support dairy farming and promote agricultural production efficiency, USDA farm service agencies have developed different agricultural assistance programs (USDA FSA MILC). For example, the Milk Income Loss Contract program (MILC) offers direct payments to dairy producers who receive a fluid milk price below feed-cost adjustments of $16.94 per hundredweight (USDA FSA MILC). In addition, USDA university agricultural extension services provide critical assistances to aid production efficiency. For example, University of Wisconsin Dairy Extension developed software to help dairy farmers select the correct reproductive management program to maximize herd reproductive efficiency (Wisconsin Agriculturist, 2010); farm loan programs offer loans to qualified dairy borrowers; and Cooperative Working Together (CWT), a producer sponsored program, helps stabilize milk prices by charging dairy producers a small monthly dues. However, it is still unclear whether dairy managers seek help from these programs during the difficult economy.

Anecdotal evidence has shown that New York dairy managers have started employing a number of management changes to reduce the impact from the difficult economy, but many questions remain unanswered such as: 1) Are there specific management tactics dairy managers perceive useful? If so, what are these tactics? 2) Does the perceived level of economic hardship motivate farm adoption of these tactics? 3) Will larger farms with bigger herd sizes differ from smaller farms in the practice of these tactics? 4) Are agricultural assistance programs a source of help, especially to those managers who have felt pressure from the adverse economy? The purpose of this study is to answer these questions using a random sample collected from101 dairy farms located in 27 counties in New York State. Questionnaire information will be used to analyze the perceived effectiveness of selected management tactics and examine the adoption of these tactics.

2. Literature Review

Schumpeter (1976) described an economic downturn as the process of creative destruction, “that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one” (Schumpeter 1976, page 83). According to him, the impact of an economic downturn must be judged over time as “it unfolds through decades or centuries.” He adds, “Failures and cutbacks in all of the weakened industries have left a long-lasting impact on the contours of the economy in ensuing years” (Schumpeter 1976, page 83).

One of the unavoidable consequences of economic recession is a high rate of business failure.A great deal of literature has studied how to help firms avoid failures and what successful strategies can be employed to survive the recession. Theoretical economic works view information as having a crucial role in helping firms survive (Green and Porter 1984; Howitt, 1991; Pearce and Michael, 1997). During an economic slowdown, firms want to understand whether general economic weakness causes falling prices or the price drop is a result of the weakened power of dominant firms. To detect opportunities and threats, firms want to better understand macroeconomic environments and industry conditions in order to make timely adjustments. The marketing strategy literature has noted that firms who perform well focusing on customers, competitors, and market conditions, are able to make timely adjustments to utilized available opportunities (Kohli and Jaworski, 1990, Pearce and Michael, 1997). Market-oriented firms were also found to quickly diversify into more recession-resistant activities to reduce potential losses. For instance, firms were found to hire more sales people to strengthen adverting in order to offset the negative impact from the economic recession (Pearce and Michael, 1997).

Numerous marketing studies have shown that firms who suffer during an economic slowdown are likely to save in order to mitigate financial losses (Pearce and Robbins, 1993). For instance, Hofer (1980) revealed a positive relationship between the severity of a firm’s financial difficulties and its actions to dramatically cut costs. However, in the business press, researchers believe that cost reduction should be moderate in order to generate favorable sales and market share growth; large cost cuts are cited as a reason for unfavorable market returns

(McLaughlin, 1990).

Agricultural economics research has emphasized how farms adjust to alleviate the adverse impact of an economic slowdown, and diversification was believed to be an effective way to stabilize farm income. For example, McNally (2001) noted that British farmers diversified into bed and breakfast family hotels (a form of agro tourism) to generate additional income. Primary goals for diversified farming include more effective use of available resources (McInerney and Turner, 1991), and a reduction in overall farm risks (McInerney and Turner, 1991). Barbieri and Mahoney (2009) used a web-based survey to gather information from Texas farms and they identified a list of motivations for diversification. This list included, in order of importance, generating income, enhancing the family's quality of life, and better use of farm resources especially labor. Expansion was cited as another strategy for farms to succeed. In another study conducted by Barbieri, Mahoney, and Butler (2008), researchers surveyed respondents from the United States, Canada and Mexico and found that if farms diversify they engage in two or more categories of production, marketing, and agritourism. Inwood and Sharp (2012) studied rural-urban-interface farms' adaptation strategies to reduce the impact of urbanization. They used face-to-face interviews with farm families from Ohio and Michigan to analyze farm adaptation strategies and concluded that farms expand acreage to increase production volume, with the ultimate goal to support additional family labors. Similar results were concluded from a study conducted in New Zealand. Johnsen (2004) used a case study to examine farm-level responses to the removal of agricultural input subsidies at a time when international prices for agricultural products were low. The study showed that New Zealand farms reduced the use of paid laborers but increased the use of unpaid family members.

The personal characteristics of farm operators determine what adjustments the farm may pursue. Gladwin (1991) found that during a farm crisis women increase their time and scope of work to help the business survive. Other studies noted that both women and men work off the farm to supplement total earned income (Salamon, 1992; Barlett, 1993; Schulman and Cotton, 1993; Lasley et al. 1995). Research has also looked into how financially viable farms can better survive economic hardships. In one pioneering effort, What's more et al. (1987) found that farms with a strong capital base can better survive financial difficulties because they utilize available savings to pay necessary business activities.

When studying an individual farm's ability to use external financial services, Zellers and Sharma (2000) noted that the farm's ability varies with its physical capital such as land, farm owners' health status, the farms' connection to social networks, and their participation in agricultural organizations. With better access to external financial resources such as farm loan programs, the farm can better adopt capital-intensive technologies. Improved access to credit also allows better utilization of more expensive yield-enhancing crops to generate higher output per unit of labor and land (Feder, Just, Zilberman, 1985).

A few agribusiness studies have analyzed the impacts of farm sizeon efficiency. Kumbhakar (1993) showed that large dairy farms are more technical and scale efficient compared to small ones. Tauer and Mishra (2006) revealed increasing returns to scale and a higher cost of production forsmall dairy farmswith fewer than 100 cows. Alvarez and Arias noted the importance of managerial ability on farming efficiency, "even if there are observed diseconomies of size, a large enough increase in managerial ability could outweigh the rising portion of the average cost curve" (2003, page 141).

3. The Model

This study presents a conceptual framework to describe farm adoption of management tactics and the use of agricultural assistance during an economic downturn (Figure 1). The primary focus is to measure the impacts of managers' personal characteristics, farm traits, and the perceived economic pressure exerted on the farm from the slow economy, on managers' use of selected management strategies. The five demographic variables of age, education, leadership positions in agribusiness organizations, years in farming, and size of household,along with the three farm traits of land, herd size, and hired labor are typically used to explain farm managers' adoption of management tactics (Schulman and Cotton, 1993; Ohlmer et al. 1998; Meert, et al. 2005; Xu et al. 2009).This study introduces a new variable, perceived pressure, on the farm due to a down economy, to explore its impact on operational adjustment and managers' willingness to seek help from available assistance programs.

A canonical discriminate analysis is commonly used to compare differences between two or more groups based on all selected predictor variables simultaneously (Bibb and Roncek, 1976; Schulman and Cotton, 1993). The discriminating power of the function is measured using the canonical correlation coefficient function, which computes the relative importance of each predictor variable's contribution to the function's discriminant score. This determines how closely a variable and a function are interrelated without being affected by the variable's relationship with other variables (Schulman and Cotton, 1993). According to Fisher's (1936), standardized

canonical coefficients are similar to standardized regression coefficients in multivariate regressions in that they measure the importance of the independent variables on change in the dependent variable. The aim of canonical correlation analysis is to estimate the coefficients when the canonical correlation between dependent and independent variables is maximized.

This study analyzed the impacts of selected predictor variables on a single dichotomous criterion variable (Y) of farm managers' utilization of management tactics:

$$Y=\beta_1(age)+\beta_2(edu)+\beta_3(leader)+\beta_4(year)+\beta_5(pressure)+\beta_6(size)+\beta_7(cow)+\beta_8(labor)+\beta_9(land)$$

Where: $Y = 1$ if the respondent adopted the sample average of 6 or more tactics;

$Y = 0$ if the respondent adopted less than 6 tactics.

The maximization procedure attempts to "spread apart" the group means while simultaneously compressing the differences between the individual variable values and their respective group means (Tiedeman, 1951, page 73, as cited by Bibb and Roncek, 1976).

While maximizing the correlation coefficients we obtain the total canonical structure coefficient, or loading, which measures the simple linear correlation between each independent variable and the respective dependent variable. The standardized discriminant function coefficient is computed to unfold the contribution of each explanatory variable to the separation of the two groups.

A Probit model is used to examine the effects of the explanatory variables on the likelihood of a farm manager seeking help from farm assistance programs. Given that the dependent variable denotes the odds of being in one category relative to a reference category, the non-action sought category was chosen as the reference category. The model is built upon a latent regression (Greene, 2003):

$$y^*=\beta_1(Age)+\beta_2(Edu)+\beta_3(Year)+\beta_4(Size)+\beta_5(Cow)+\beta_6(Labor)+\beta_7(Land)+\beta_8(Leader)+\beta_9(Pressure)+\varepsilon$$

Where:
$$\begin{aligned} y &= 0 \quad if\ y^* \le 0 \\ &= 1 \quad if\ 0 < y^* \le u_1 \\ &= 2 \quad if\ u_1 \le y^* \end{aligned}$$

Where u_i is the unknown threshold value. The dependent variable is defined as a categorical variable based on whether the farm has engaged in help-seeking activities. It is coded as zero if no help was sought, 1 if actively involved in one activity, and 2 if involved in two or more activities. The mean and variance of ε are normalized to zero and one to obtain probabilities:

$$P(y=0\mid x)=\Phi(-x'\beta)$$
$$P(y=1\mid x)=\Phi(\mu_1-x'\beta)-\Phi(-x'\beta)$$
$$P(y=2\mid x)=1-\Phi(\mu_1-x'\beta)$$

Where u_1>0 and $\Phi(.)$ denotes a standard normal distribution.

$$\frac{\partial P(y=0\mid x)}{\partial x}=\phi(x'\beta)\beta$$
$$\frac{\partial P(y=1\mid x)}{\partial x}=[\phi(x'\beta)\beta-\phi(\mu_1-x'\beta)]\beta$$
$$\frac{\partial P(y=2\mid x)}{\partial x}=\phi(\mu_1-x'\beta)\beta$$

Where ϕ (t) denotes the standard normal density.

4. The Survey and Data

New York State was selected for this study because it is the nation's fourth largest milk producer with total dairy production of 12.7 billion pounds and $2.2 billion in 2010, which accounted for over 50% of New York's total farm sales (New York Department of Agriculture & Market, 2011). A total of 110 questionnaires from in-person interviews with dairy managers in 27 counties were obtained between March and April 2009. Respondents were categorized into the five regions of North (38%), South (33%), East (10%), West (5%), and Central (13%), based on address and zip code. Nine collected surveys had missing information and were dropped, resulting in 101 useful observations.

The seven-page questionnaire included the dairy management strategies published by the Wisconsin Farm Center (Wisconsin Center for Dairy Profitability, 2009). Pre-interviews with New York dairy managers provided

(Wisconsin Center for Dairy Profitability, 2009). Pre-interviews with New York dairy managers provided important insight for construction of the questions regarding the perceived impact of the economic slowdown. Four open-ended questions were added to solicit farm managers' opinions about effective management tactics. The draft questionnaire was pre-tested with dairy managers to ensure accurate communication of meaning for each question.

Questions were organized into five sections. The first and second sections inquired about the adoption of specific management practices to improve dairy and crop production efficiency, farm finance efficiency, and the top three most effective strategies to improve farm finance, livestock management, and crop management. The third section asked if dairy managers felt pressure from falling milk prices, high costs of feed and labor, and high operation costs, as well as how managers sought help from agribusiness assistance programs. This was followed by questions about managers' opinions regarding their utilization of available agricultural assistance programs. Questions about farm characteristics and managers' demographics concluded the survey.

A summary of the surveyed managers' demographic information appears in Figures 2 through 6. Over 60% of our respondents were between 45 and 64 years old, with a well-fitted normal distribution indicating that only a small percentage of our respondents were younger than 35 or older than 65 (Figure 2). Most respondents (92%) have completed a high school education or beyond, with 25% college graduates (Figure 3). These statistics are higher than the New York State county-level education statistics, which show that only 30% of the population in rural New York has completed high school and 20% completed college (USDA, ERS, 2000). Though a high percentage (63%) of surveyed dairy managers have not held any leadership position in local, state, regional, or national dairy organizations in the past five years, 37% of them have held at least one position in dairy related organizations (Figure 4). Respondents have 33 years of dairy farming experience on average, with 14% reporting more than 50 years experience (Figure 5). Seventy-two percent of these managers have a family of three or more members (Figure 6).

Average farm size was 490 acres of land, while 19% had less than 100 acres and 10% had 1,000 acres or more. Many of these farms (53%) produce no cash grain but 36% devote 50 acres or more towards cash grain (Figure 7). All surveyed farms were family owned (Figure 8) and the average family ownership period was 54 years; 45% of the respondents reported family ownership of over 50 years and 32% reported ownership of 29 years or less.

Most surveyed dairy farms (89%) hired part-time or full-time workers (Table 9). On average, larger farms (500 cows or more) employed 17.25 part-time and full-time workers; mid-size farms (100-500 cows) employed 3.2 workers; and small farms (100 cows or less) employed 4.17 workers. The higher labor employment by larger dairy farms was statistically significant (t statistics = -2.91). To determine wether larger households (5 people or more) utilize family workers as farm labor more than smaller households (2 people or less), the relationship between household size and number of hired workers was analyzed. No statistically significant relationship was determined (t statistics = 1.27).

Surveyed farms owned 380 cows on average, 65% had 199 cows or less and 18% had 500 cows or more (Figure 11). The sample contained a low percentage of both smaller farms (with less than 50 cows, 8%) and larger farms (500 cows or more, 18%) compared to farms with 50 to 200 cows (57%). The economic efficiency of these smaller and larger farms was examined (Tauer, 2001; Tauer and Mishra, 2006) and the study concluded that frontier production cost for a 50-cow farm was only slightly higher than the larger 500-cow farm. Thus, efficient small dairy farms have the potential to compete with larger farms. This lack of production efficiency of smaller dairy farms could be a result of inefficient management practices. This was explored by analyzing the relationship between herd size and farm managers' adoption of different management tactics. Results indicated that all surveyed farms with 380 cows or more had adopted at least seven listed management tactics, compared to 38% of smaller farms which adopted six or fewer strategies.(Prob=0.07) (Table 1).

According to Brake and Boehlje (1985), farm level adjustments to financial crisis aim to: 1) increase net income; 2) restructure liability; and 3) restructure assets. As Brake and Boehlje showed, specific adaptations could include lowering costs, using off-farm workers, reducing debt, selling land, reducing low yielding land, and investing in high yielding land. This survey included a list of similar potential strategies. Results indicate that almost all surveyed dairy farms (99%) have used at least one management tactic to mitigate the impact of economic stress. The prevailing tactics used to reduce production costs included reducing feed spoilage (90%), cutting utility costs (89%), reducing the use of feed protein and additives (72% and 71% respectively), and culling cows (67%). Similar to Gladwin and Zulauf (1989, p. 260, as cited by Schulman and Cotton, 1993), this study found that surveyed dairy farms used more family labor to reduce labor costs (56%). However, in contrast

to the Gladwin and Zulauf study, which concluded that farm operators work off the farm to finance the family business, our sample suggests only a small percentage of dairy farm family members (26%) worked off the farm to compensate for farm income losses. This may be a result of the nature of dairy farming which requires a stable and intense on-farm labor input to ensure on-time feeding, milking, and barn cleaning.

To improve farm level financial situations, surveyed farm families refinanced existing debts (42%) by taking advantage of the current low interest rates, and many increased their lines of credit (64%). In addition, one third of the respondents restructured assets by eliminating idled machinery to improve operation efficiency (33%) (Table 2).

The structure of the dairy industry has been greatly influenced by commodity prices (Huirne et al, 1997; Tauer and Mishra, 2006; Barbieri and Mahoney, 2009). The current economic slowdown has further increased the economic uncertainty of dairy farming. This study measured farm managers' perceived economic pressures from falling milk prices, and rising feed, operation, and labor costs (Table 3). Most respondent managers felt at least some pressure from falling milk and dairy products prices (91%). According to a USDA milk production report, the wholesale and retail price for milk and dairy products declined considerably in April 2009, the time when this survey was conducted (Cropp, 2009). This severe market situation was reflected in producers' milk checks where the price per hundred weight for class I fluid milk in April 2009 was $13.61, seven dollars lower than the April 2008 price of $21.86 (USDA AMS, North East Market Order Bulletin). For many New York producers, such a low price cannot cover their production costs of about $15/hundredweight. This dramatic milk price reduction was coupled with an historical high feed price which resulted from corn being diverted tothe production of ethanol. Seventy-four percent of the surveyed dairy managers reported being worried about rising feed costs.

Given the reduction in income, farm managers were also greatly concerned about rising operation costs, including labor, rent, utilities, and taxes (68%). Approximately 36% of the respondents reported feeling pressures on the business due to labor cost. The ample availability of Hispanic workers in New York dairy farming may be a reason for this low perceived pressure from labor costs (Maloney, 1999).

5. Econometric Analysis and Results

In this analysis, the dichotomous criterion variable is separated into two groups. The first group, coded as *1*, represents a farm that has adopted six or more strategic measures to reduce costs, restructure liability, and revaluate assets (termed a broad-adopter of management tactics). The second group, coded as zero, represents a farm that adopted less than six strategic measures (termed a narrow-adopter). Definitions of all the predictor variables and the computed coefficients are presented in Table 4.

Tests of the discriminant function suggest a statistically significant difference between the two selected groups. The canonical correlation of 0.543 indicates that 54.3% of the variation in the two groups is accounted for by the given discriminant function. The high Wilke's Lambda (0.705) allows rejection of the null hypothesis that the two groups have the same mean discriminant function scores. The group centroids (means) of -0.342 and 0.138 are well apart, which shows that the discriminant function is efficient in differentiating the two groups. The redundancy measure of 0.295 for the first canonical variant suggests that about 30% of the variance in the Y_1 variable is accounted for by the Y_2 variable and the selected predictor variables. This relatively low redundancy measure is not problematic because the canonical correlation has two dependent variables, each of which has only a portion of the other dependent variable's total variance. Thus, we cannot expect 100% of the variance in the dependent variables to be explained by the independent variables and the other dependent variable.

The relative importance of each predictor variable in explaining the differences between the two groups is measured by the standardized canonical coefficients. These coefficients determine the unique contribution of each of the predictor variables to the differences between the two groups. Results suggest that managers' leadership positions (LEADER, 0.752), herd size (SIZE, 0.683), and managers' perceived pressure on key business parameters due to economic conditions (PRESSURE,0.618) are associated with the group that have used more than six management tactics to reduce the impact of the economic downturn (a broad-adopter). In other words, the surveyed farm households that have made broader changes in cutting costs and restructuring liabilities and assets, differ from those that made fewer changes in terms of their participation in dairy organizations, their herd size, and their response to the economic downturn. Among the three significant variables, leadership positions contribute the most to the group differences; findings indicate managers who participated in more than one dairy organization during the past five years tended to adopt six or more tactics to improve the production and finance situation of the farm. In addition, results indicate the adoption of management tactics is a response to the total number of cows owned and larger farms, those with herd sizes of 385 cows or more, tend to make more changes than smaller farms. Results suggest the perceived pressure from

the economic downturn differentiates farms that have attempted to profoundly modify management structure from those who made less effort or showed no attempts. Surveyed managers are likely to be "broad-adopters" if they feel pressures from costs of feed, labor, farm operations, and low milk prices.

The total canonical structure coefficients are calculated to measure how closely a variable and a function are interrelated, and are not affected by relationships between groups; i.e. it denotes the simple correlations between the selected predictor variables and its function (Klecka, 1982). The resultant structure coefficients suggest that herd size (COW, 0.479), number of employees hired (LABOR, 0.263), managers' leadership positions (LEADER, 0.255), and perceived economic pressure (PRESSURE, 0.214) are dominant variables that positively correlate to the broad-adopter group. For example, the broad-adopter group tends to hire six or more full-time employees compared to the narrow-adopter group. Analyzing both types of the discriminant coefficients shows herd size, managers' leadership positions, and perceived economic pressure stand out as the most important variables accounting for the difference between the two groups. Thus, these factors drive the management tactic adoption decisions.

In an effort to understand dairy farm managers' help-seeking activities, respondents were asked if they had sought help from agricultural assistance programs during this economic downturn. First, dairy managers were asked if they actively seek help from farm assistance programs and if so, which programs do they consult. In this study help-seeking activities were defined as: 1) actively sought help from all agricultural assistance programs (42%); 2) actively sought help from farm loan programs (39%); 3) actively sought help from state agricultural extension programs (36%); 4) actively sought help from dairy support programs, such as the Milk Income Loss Contract (MILC) program (12%) and 5) actively sought help from USDA Farm Service Agency (FSA) programs (9%). The first activity (#1) describes seeking help from all programs; activities 2-5 describe seeking help from each individual program.

The goodness-of-fit statistics for the Probit model, the coefficient estimates, and the standard errors are reported in Table 5. The likelihood ratio Chi-square value is high (Likelihood ratio Chi-square=16.56; (Pro>chi2) =0.06), indicating a statistically significant overall model goodness-of-fit was obtained. The ordered probit regression coefficients measure the effect of a one-unit change in the independent variable on the probability (log-odds) of being in one category (dependent variable) relative to the reference category, while controlling for effects from all other exogenous variables. Two variables were found to have a statistically significant impact on dairy managers' help-seeking activities: 1) perceived economic pressure (PRESSURE, Alfa<0.05); and 2) acres of land owned by the farm (LAND, Alfa<0.05). This suggests a respondent who feels pressure from at least two out of the four listed categories of low milk prices, high feed costs, high labor costs, and high operating costs, tends to actively seek help from agricultural assistance programs.

The ordered probit coefficients represent the increase in the probability of a dependent variable caused by a one unit change in an independent variable. The coefficients are hard to interpret. Therefore, the marginal effects were computed to better explain these coefficients. It was determined that compared to dairy managers who did not feel pressure, those who felt pressure were 14.2% more likely to engage in two or more help-seeking activities. During the interview, many dairy managers expressed concerns about the ongoing economic situation and many of them considered dairy farming "a stressful occupation," not only because of factors such as weather change but also unfavorable market situations. It was discovered the amount of farm-owned land has a statistically significant negative impact on managers' help seeking activities (LAND, Alfa<0.5). Specifically, dairy managers are less likely to seek help if they own 500 acres or more. Managers with larger land tracts are, on average, 17.4% less likely to seek help compared to managers of smaller farms. This finding is substantiated by previous studies. According to one study, when facing farm crises, larger farms, were found to increase farm size through land rentals and tend to "double up to catch up", rather than seeking support from farm assistance programs (Barlett, 1984). In addition, Fitchen (1991) found that larger farms in localities where the demand for land was strong tend to sell land to obtain cash support (Fitchen, 1991, as cited by Schulman and Cotton, 1993).

6. Conclusions

Efficient use of management tactics plays a crucial role in improving dairy farmers' allocation of resources, production, and finance decisions. Using a small sample from 101 dairy farms in New York State, it was determined that individual dairy farms have applied different management strategies to adapt to changing economic conditions. Discriminant analysis was used to understand the differences between a broad-adopter who applied six or more strategic measures and a narrow-adopter group who applied less than six measures. Results indicates managers in the broad-adopter group tend to have a larger herd, hold a leadership position in dairy organizations, and perceive pressure from the economic slowdown. This broader-adopter group includes leaders

in dairy organizations and they are more likely to conduct adaptive changes during the economic slowdown.

The analysis also shows that a majority of farm managers have sought help from farm assistance programs (72%). This help-seeking behavior can be better facilitated if agricultural assistance programs address specific farm needs. A further examination of factors influencing these help-seeking activities shows that managers are more likely to seek help if they felt pressure from the unfavorable economy. Thus, it is urgent that the agribusiness assistance programs plan necessary services to provide managers access to the programs.

Further analysis on managers' help-seeking activities revealed that farms with larger tracts of land are less likely to look for help and managers' of smaller farms tend to request help more frequently. Given larger commercial farms already receive more help from existing agricultural support programs (Humphries, 1980), they are less likely to inquire further assistance. Thus, major programs may consider including managers of smaller farms as their target participants.

Open-ended questions helped detect many small dairy farms rent land and have experienced difficulties renewing rental agreements. Thus, they specifically seek help to secure the use of rental land. Agricultural assistance may be provided to help these smaller farms renew land-rental agreements because without sufficient land resources, smaller dairy farms may be further marginalized.

Given the strategic position of dairy farming in U.S. agriculture, it is of great importance for policy makers to understand the challenges faced by dairy managers. Agricultural policies of the past have been more oriented toward larger dairy farms, but both small and large farms seek help to better understand the usefulness of management strategies on production efficiency. In places where agricultural assistance is not available, appropriate help may be planned to help both small and large farms survive economic downturn.

Samples used for this study are from New York State only and from dairy farms that are still in operation. Thus, our sample may not represent the dairy farming industry in the entire United States and cannot represent the many small farms that had closed by the time this sample was collected. However, given the fact that little information is available to understand dairy management strategies used during the economic slowdown, findings reported in this study are of great value for agricultural policy planners in developing appropriate assistance mechanisms to help dairy farms survive unfavorable macroeconomic events.

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Table 1. The Impact of Herd Size on the Adoption of Management Strategies (2009Data)

Own 380 cows or fewer (77 farms)	Own more than 380 cows (23 farms)
Adopted six or fewer strategies	
29	23
38%	0%
Adopted seven to ten strategies	
40	20
52%	87%
Adopted eleven to thirteen strategies	
8	3
10%	13%
Likelihood ratio Chi(2)	20
Probability	0.07

Source: Authors' Computation Using STATA

Table 2. Reported Utilization of Specific Strategies (n=101, 2009data)

Reported utilization of specific strategies (n=101)	
Lower costs strategies	Percent
None	1%
Any	99%
Use of specific strategies	% of using farms*
Reduced feed spoilage	90%
Cut utility cost	89%
Switched feed protein	72%
Reduced use of feed additives	71%
Cull cow	67%
Use of more family labor	56%
More efficiently use manure as fertilizer	51%
Used corn-soybean rotation more	40%
Stock up feed	33%
Take off-farm jobs	26%
Restructure liability	% of using farms*
None	29%
Any	71%
Refinanced existing debts	42%
Increased a line of credit	64%
Restructure assets	% of using farms
None	67%
Used	33%
* Percentages do not total 100% because responses are not mutually exclusive.	

Source: Authors' Computation Using STATA

Table 3. Reported Economic Pressures (n=101, 2009data)

Pressure from low dairy product price		% reported (n=101)
	Did not feel	9%
	Felt some pressure	9%
	Felt a high pressure	82%
Pressure from high feed costs		
	Did not feel	11%
	Felt some pressure	15%
	Felt a high pressure	74%
Pressure from high operation costs		
	Did not feel	11%
	Felt some pressure	21%
	Felt a high pressure	68%
Pressure from high labor costs		
	Did not feel	32%
	Felt some pressure	32%
	Felt a high pressure	36%

Source: Authors' Computation Using STATA

Table 4. Results of Canonical Discriminant Analysis: Broad – adopters and Narrow-adopters of Farm Management Strategies (n=101, 2009data)

Predictor variables		Standardized Canonical Discriminant Function Coefficient	Total Canonical Structure Coefficients
AGE	Age (1 if <54)	-0.028	-0.038
EDU	Education (1 if > high school)	-0.261	0.003
YEAR	Years in dairy farming (1 if >33 years)	-0.021	0.018
SIZE	Household size (continuous)	0.012	0.063
COW	Total cow number (categorical*)	0.683	0.479
LABOR	Number of employees hired (1 if >6)	-0.200	0.263
LAND	Total farm owned land (1 if >500)	0.038	0.185
LEADER	Hold leadership positions (1 if more than one position)	0.752	0.255
PRESSURE	Felt pressure due to downturn (1 if more than two sources)	0.618	0.214
Redundancy measure		0.295	
Canonical Correlation		0.543	
F Statistics		4.228	
Prob F		0	
Wilke's Lambda		0.705	
Group "Centroids" (means)			
Broad strategy adopters		-0.342	
Narrow strategy adopters		0.138	
* Total Cow number: 1 if <=100; 2 if more than 100 and less than 200; 3 if more than 200 and less than 500; 4 if more than 500 and less than 1000; 5 if 1000 or above			

Source: Authors' Computation Using STATA

Table 5. Marginal Effects for Help-seeking Activities from Agricultural Assistance Programs (n=101, 2009data)

Variables	Coefficients	Marginal Effects	
		Actively took one activity group	Actively took two or more activities group
AGE	-0.680 [0.486]	-0.047 [0.042]	-0.083 [0.060]
EDU	0.486 [0.421]	0.0337 [0.034]	0.060 [0.052]
YEARS	-0.014 [0.449]	-0.001 [-0.03]	-0.002 [0.055]
SIZE	0.640 [0.418]	0.0444 [1.180]	0.078 [0.052]
COW	0.807 [0.696]	0.056 [0.058]	0.099 [0.086]
LABOR	0.377 [0.614]	0.026 [0.045]	0.046 [0.075]
LAND	-1.425** [0.617]	-0.099 [0.069]	-0.174** [0.078]
LEADER	0.275 [0.438]	0.019 [0.031]	0.0337 [0.054]
PRESSURE	1.157** [0.530]	0.080 [0.056]	0.142** [0.067]
N	n=101		
LR chi-square	16.56		
Prob>chi2	0.06		
Standard errors are reported in brackets			
** - represent a statistical significance at α=0.05 to 0.01			

Source: Authors' Computation Using STATA

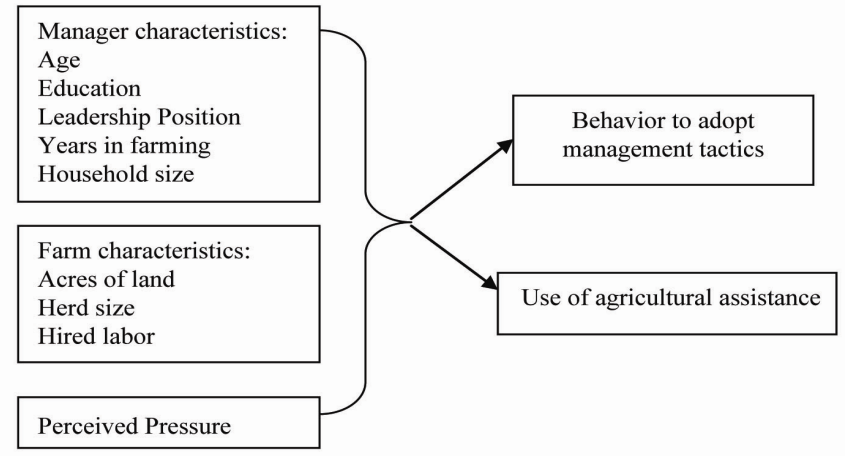
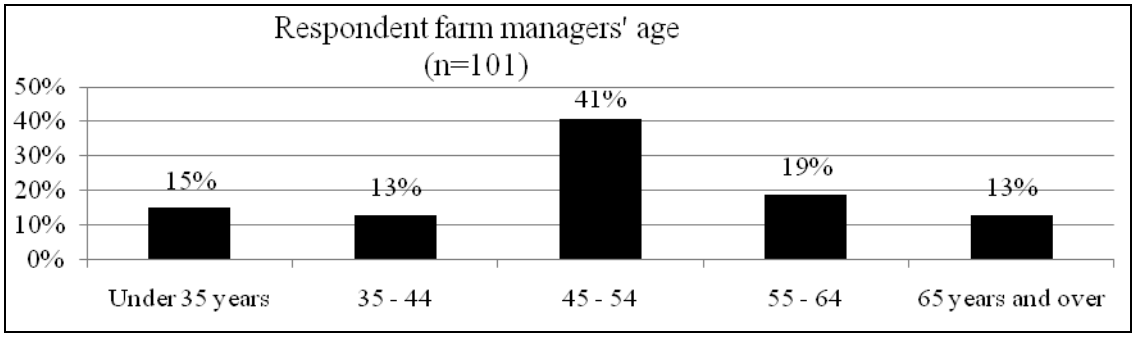


Figure 1. The Conceptual Framework of Agribusiness' Adoption of Management Tactics during an Economic Slowdown

Source: Authors' Computation Using STATA



Figures 2. Respondent farm managers' age

Source: Authors' Computation Using STATA

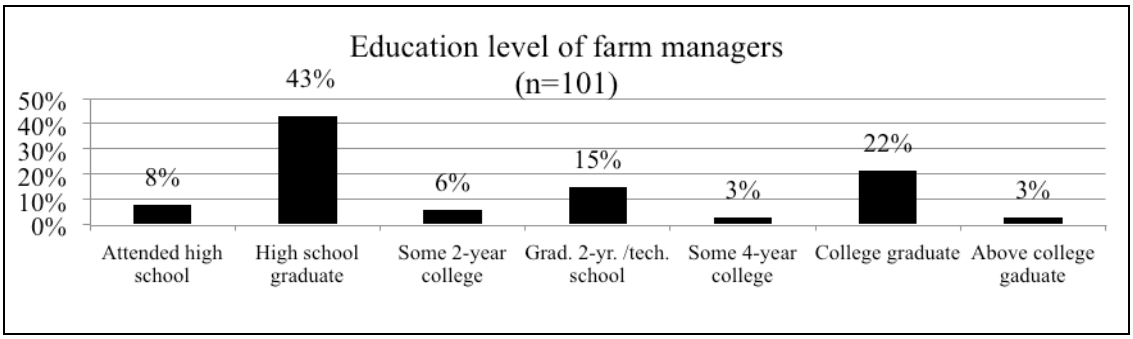


Figure 3. Education level of farm managers

Source: Authors' Computation Using STATA

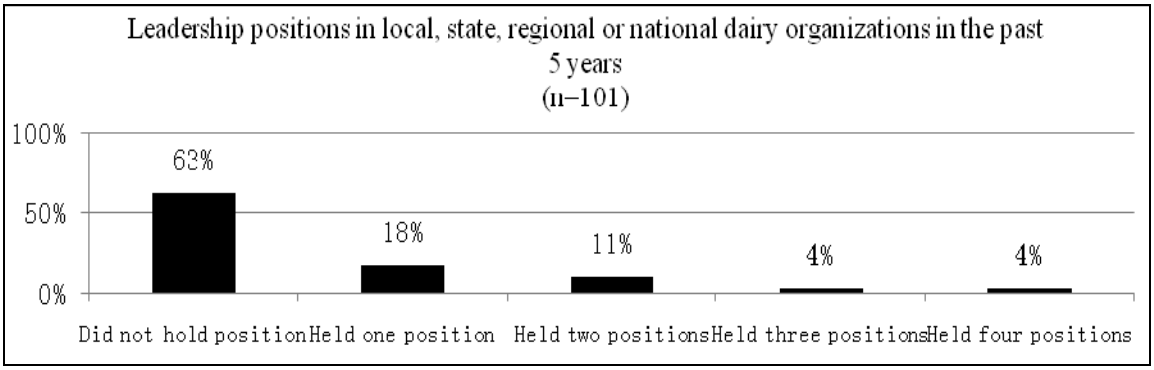


Figure 4. Leadership positions in local, state, regional or national dairy organizations in the past 5 years

Source: Authors' Computation Using STATA

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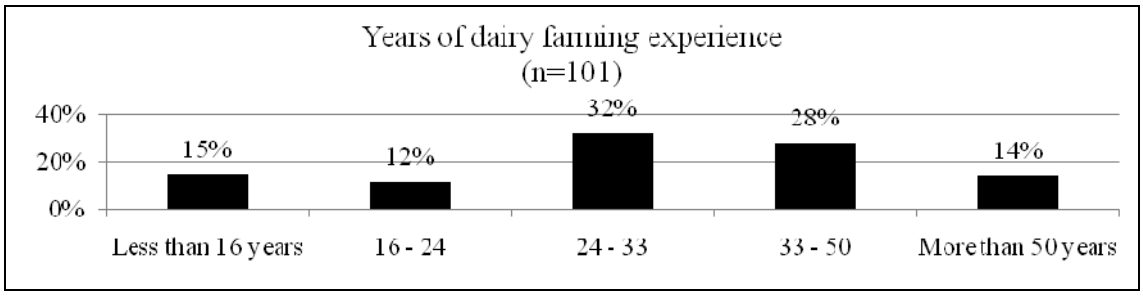

Figure 5. Years of dairy farming experience

Source: Authors' Computation Using STATA

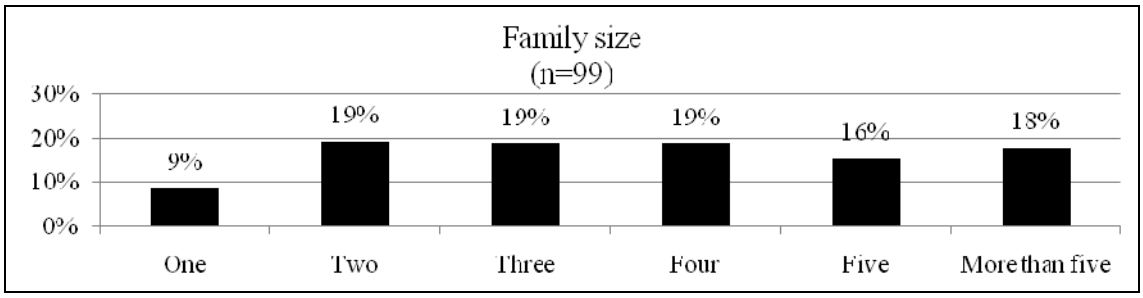

Figure 6. Family size

Source: Authors' Computation Using STATA

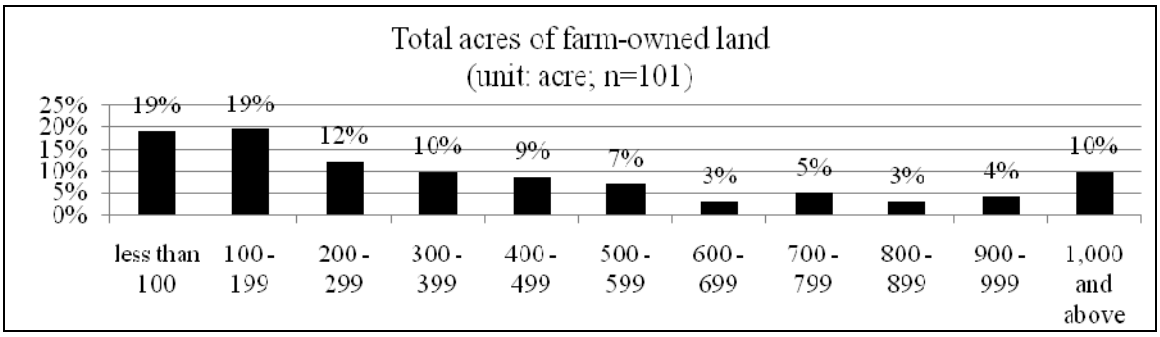

Figure 7. Total acres of farm-owned land

Source: Authors' Computation Using STATA

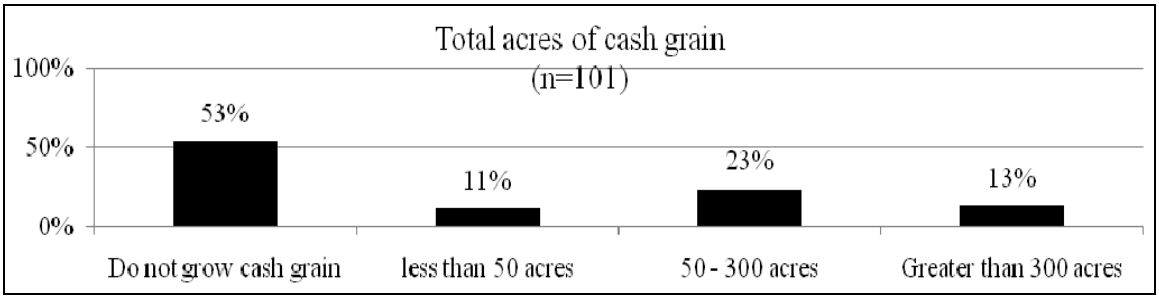

Figure 8. Total acres of cash grain

Source: Authors' Computation Using STATA

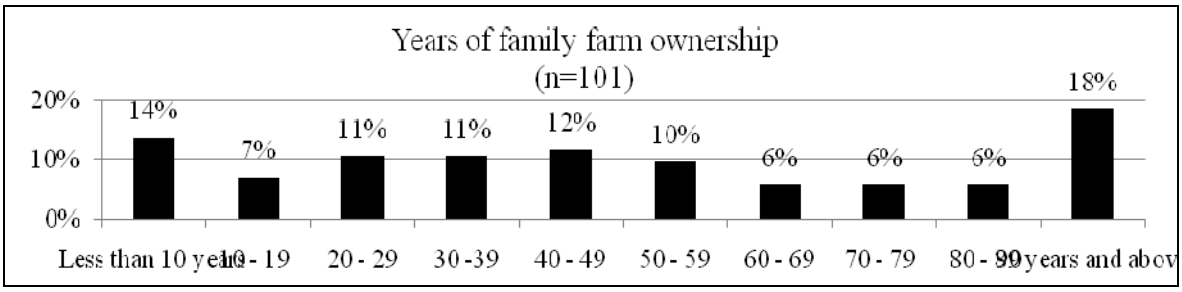

Figure 9. Years of family farm ownership

Source: Authors' Computation Using STATA

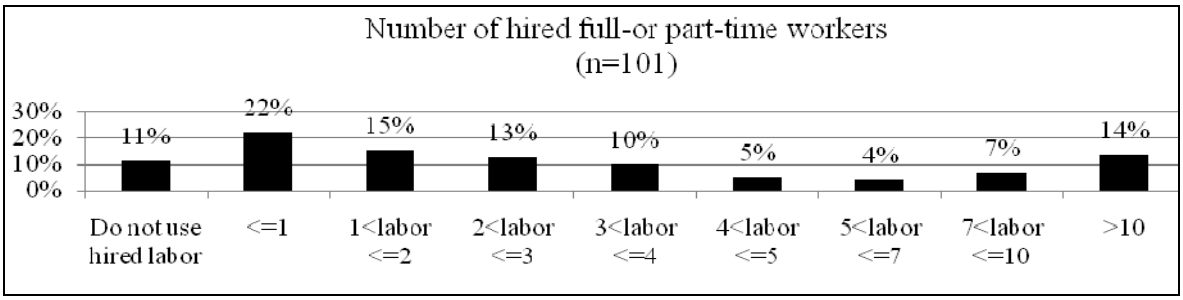

Figure 10. Number of hired full-or part-time workers

Source: Authors' Computation Using STATA

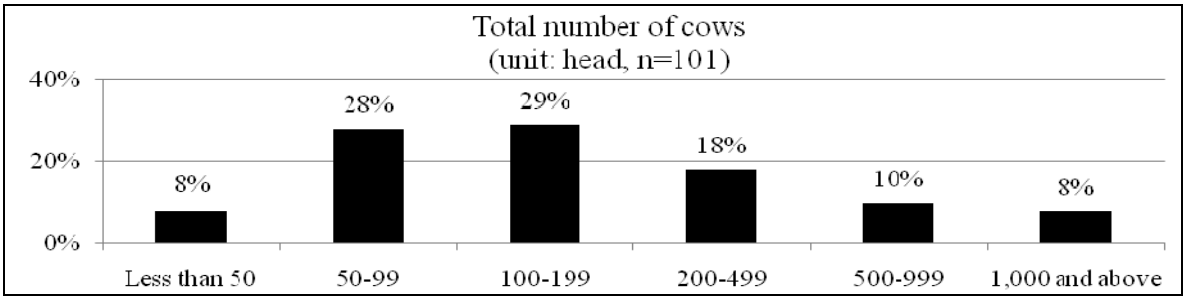

Figure 11. Total number of cows

Source: Authors' Computation Using STATA

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