Determinants of dairy farmers' participation in the Milk Income Loss Contract program

J. D'Antoni and A. K. Mishra¹

Department of Agricultural Economics and Agribusiness, Louisiana State University AgCenter and Louisiana State University, Baton Rouge 70803

ABSTRACT

The Milk Income Loss Contract (MILC) program is a counter-cyclical income support program that was designed to provide price support to dairy farmers. Since inception of MILC, it has been argued that the program is inefficient and rewards inefficiency by keeping high-cost, small dairy farms in business. Using farm-level data and the probit estimation method, we investigated the factors that affect a farmer's decision to participate in the MILC program. Participation in the MILC program was positively correlated with the farmer's educational attainment, participation in the organic certification cost share subsidy program, off-farm work by spouses, and financial recordkeeping. Consistent with theory, participation in the MILC program is negatively correlated with the price of milk. Finally, contrary to the established narrative of large dairy producers, medium-sized dairy farms are more likely than large farms to participate in the MILC program.

Key words: milk income loss contract (MILC) payments, organic certification subsidy, farm size, financial recordkeeping

INTRODUCTION

The 2002 Farm Security and Rural Investment Act (2002 Farm Bill) initiated the counter-cyclical dairy income support program known as the Milk Income Loss Contract (MILC) program. The MILC program was designed to provide price supports to dairy farmers when milk prices fell below a target level for the Boston Federal Milk Marketing Order (FMMO) class I price. To receive program payments, a dairy farmer must earn a nonfarm, adjusted gross income of less than \$500,000 (Chite, 2007). Payments are only eligible for up to 2.4 million pounds of milk (1.1 million kg) produced within the fiscal year 2005. The MILC program was renewed

in the 2008 Farm Bill and the limit was increased to 2.985 million pounds (1.36 million kg). However, the limit decreases to 2.4 million pounds in fiscal year 2012. Enrolled dairy farmers receive MILC payments if the market price of milk falls below the target level. Since its inception, the MILC program has paid approximately \$3.5 billion in total payments to US dairy farmers (Figure 1).

The primary elements of the MILC program consist of the following 2 parameters. First, the target price [\$16.94 per hundredweight (cwt)] of milk is compared with the monthly Boston class I price. When the price of class 1 milk drops below \$16.94/cwt, a premium is paid to bring it up to that minimum price. Because class 1 milk represents about 50% of the milk sold, the actual price floor fluctuates plus or minus \$0.50 around the targeted price floor for the blend price of \$13.69. If the Boston class I price is less than the target price, then all producers are eligible to receive a deficiency payment of 45% of the difference. Additionally, the target price is increased if feed prices exceed a base level (\$7.35/cwt). The feed price is based on the cost of a standard dairy ration, referred to as the National Average Dairy Feed Cost (see Dairy Policy Analysis Alliance, 2010 or visit <http://future.aae.wisc.edu/> for more information). Second, producers receive payment on no more than 2.4 million pounds (or 1.1 million kg) of milk marketed in any fiscal year (October–September, see Table 1). Once enrolled, the producer cannot withdraw from the program and then re-enroll during the same fiscal year.

Timing issues exist related to the payment date. Consider Table 1, which illustrates the MILC payments for 2005. Milk prices fell below the target level in June, but actual payments were not made at that time. At the end of June, the initial payment estimate was calculated as 45% of the spread between actual and target prices. The actual payment rate was not calculated until the end of the following month when the National Agricultural Statistics Services (NASS) released figures for the National Average Dairy Feed Ration Costs. Actual payments to the farmers were then made in August after 2 mo of above-target prices.

Received May 17, 2011.

Accepted September 16, 2011.

¹Corresponding author: amishra@agcenter.lsu.edu

Figure 1. Total payments under the Milk Income Loss Contract program. Source: <http://future.aae.wisc.edu/>.

Although the MILC program imposes a production limit on milk eligible for payment during the fiscal year (October–September), it also allows each producer to select the month to initiate payments during the fiscal year (Chite, 2007; Jesse et al., 2008). It has been argued that, given a chance to participate in federal programs like MILC, virtually all dairy producers would participate. However, data from the 2005 Agricultural Resource Management Survey (ARMS) shows that 58% of producers, averaging 7,815,427 pounds (3.5 million kg) of milk production, did not participate in the MILC program. Since the program's inception, it has been argued by critics that the MILC program is itself inefficient and that it further rewards inefficiency by keeping high-cost, small dairy farms in business. In particular, large dairy producers have expressed concerns that MILC payments have negatively affected their farm income (Jesse et al., 2008). The MILC program has also been criticized for extending the length of low price periods and shifting the responsibilities of supply adjustment to large dairy farmers (Jesse et al., 2008).

The MILC program has received relatively little attention in the academic literature. Two primary factors explain the paucity of research in this area. First, scarce data are available to research this issue. Second, the dairy industry is regionally concentrated in Midwest

states such as Minnesota and Wisconsin, Northeast states such as Vermont, New York, and Pennsylvania, along with some large dairy farms in California, which has led to state-level or regional studies with some observations but none specifically on the MILC program. With more than half of dairy operations not participating in the MILC program (ARMS, 2005) and average production over 2 times the production limit for MILC payments, a question arises: What factors affect dairy farmers' participation in the MILC program? Thus, the objective of this study was to investigate factors that affect dairy farmers' decision to enroll in the MILC program.

Literature on the determinants of participation in various dairy farm programs is scant; however, substantial relevant literature exists on the topic of MILC as a whole. In the early stages of the MILC program, Gould and Hackney (2003) concluded that given the seasonality in milk prices and production limits, large dairy farms might time their annual enrollment in the program to maximize the expected level of MILC payments. Jesse (2005) criticized the configuration of the MILC program and indicated that it is detrimental to the dairy industry in the long term. Herndon et al. (2005) examined the effect of the MILC program on milk production levels in 20 states. Using monthly data

Table 1. Milk Income Loss Contract payments per hundredweight (cwt) in fiscal years (FY) 2002–2006 (source: <http://future.aae.wisc.edu/>)

Item	Month ¹											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
FY 2003												
Announced class I mover ²	10.15	10.60	10.52	10.56	10.23	9.81	9.64	9.71	9.74	9.77	10.97	13.71
Total deficiency ³	3.54	3.09	3.17	3.13	3.46	3.88	4.05	3.98	3.95	3.92	2.72	0.00
(\$/cwt ⁴ = \$13.69, class I mover)												
Payment rate at 45% (\$/cwt)	1.5930	1.3905	1.4265	1.4085	1.5570	1.7460	1.8225	1.7910	1.7775	1.7640	1.2240	0.0000
FY 2004												
Announced class I mover	14.27	14.37	13.84	11.85	11.59	11.94	13.64	19.65	21.13	17.95	14.62	13.94
Total deficiency	0.00	0.00	0.00	1.84	2.10	1.75	0.05	0.00	0.00	0.00	0.00	0.00
(\$/cwt = \$13.69, class I mover)												
Payment rate at 45% (\$/cwt)	0.0000	0.0000	0.0000	0.8280	0.9450	0.7875	0.0225	0.0000	0.0000	0.0000	0.0000	0.0000
FY 2005												
Announced class I mover	14.78	14.29	14.43	16.65	13.79	15.43	14.13	14.80	13.62	13.89	14.44	13.70
Total deficiency	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00
(\$/cwt = \$13.69, class I mover)												
Payment rate at 45% (\$/cwt)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0315	0.0000	0.0000	0.0000
FY 2006												
Announced class I mover	14.27	14.56	13.57	13.38	13.38	12.49	11.22	10.97	10.75	11.34	10.97	10.85
Total deficiency	0.00	0.00	0.12	0.31	0.31	1.20	2.47	2.72	2.94	2.35	2.72	2.84
(\$/cwt = \$13.69, class I mover)												
Payment rate at 34% (\$/cwt)	0.0000	0.0000	0.0408	0.1054	0.1054	0.4080	0.8398	0.9248	0.9996	0.7990	0.9248	0.9656

¹Fiscal year runs October to September.²Also known as the Federal class I milk marketing order milk price per cwt for Boston, Massachusetts.³Payments triggered when the class I price in Boston fell below \$13.69 per cwt (the old Compact class I price). Compact class I price: The minimum federal order price for milk used for class I or fluid purposes (a fixed per cwt price set by the compact commission that effectively creates a floor on the class I price of fluid milk). Fluid handlers (processors) must pay this price for any milk used for bottling purposes.⁴Measure of mass in terms of milk output; 1 cwt = 100 pounds (lb) or 45.359237 kg.

from 1995 to 2004, the authors analyzed the effect of the program through a dummy variable approach in which aggregate milk production was estimated by ordinary least squares. They found a positive and significant relationship between production levels and the MILC dummies for only 4 states (Indiana, Arizona, New Mexico, and Texas). The empirical specification of the model estimated by Herndon et al. (2005) could be characterized as a short-run response to the MILC program.

Bryant et al. (2007) investigated the effect of the MILC program on aggregate production. The authors decomposed aggregate production into dairy size (by number of cows) and milk production per cow. Using biannual data from 1996 to 2006 and a dynamic framework, the authors found no significant relationship between MILC participation and dairy size or milk production per cow. Several other studies have investigated 2 major components of federal dairy policy; namely, marketing orders and price supports. Helmberger and Chen (1994) found that the FMMO substantially increased fluid milk prices, moderately increased blend milk prices, and decreased other dairy product prices. Alternatively, Cox and Chavas (2001) analyzed various alternative dairy policy scenarios and found that eliminating FMMO would result in sharply lower fluid milk prices, somewhat lower blend milk prices, and substantially higher dairy product prices.

MATERIALS AND METHODS

Data

The data used in this research are from the Dairy Production Practices and Costs and Returns Report (Agricultural Resource Management Survey phase II, commonly referred to as ARMS). Observations were collected using a survey jointly administered by NASS and the Economic Research Service of the USDA for dairy production during calendar year 2005. The ARMS data include detailed financial information, such as farm income and expenses, as well as farm and operator characteristics. This specific survey was taken from targeted dairy operations in 24 states that account for more than 90% of national milk production and all major production areas. Detailed information about the production practices on the farm and costs of milk production was elicited. We limited our sample to those farms that produced dairy products as the primary farm practice and excluded farms with zero milk production in 2005. After accounting for nonresponse and missing data, information on 1,732 farms was used in the analysis.

Table 2 provides precise definitions and descriptive statistics for each variable used in the empirical model. Participation in the MILC program was represented by the binary variable *MILC*, which was equal to 1 if the farm received MILC payments and 0 otherwise. The price of milk (*M_Price*) was included as an explanatory variable. Control variables for farm size (*Farm Size*; small, medium, large) as defined by herd size were included in the model; large farms were used as the reference category. Regional controls, as defined by NASS, were used to assess the effect of unobserved regional factors affecting MILC participation and milk production (Atlantic, Western, Midwest, Plains, and South). Farms in the Plains and South regions accounted for approximately 5% of the sample. South was chosen as the reference region in this study because it is relatively less important in terms of milk production than the other regions.

Demographic variables such as operator's age (*Op_Age*) and education were included as nonpecuniary variables affecting participation in the MILC program. The variable *Op_Educ_C* represents farmers with a college education and beyond, *Op_Educ_H* represents high school education and some college, and *Op_Educ_B* represents farmers with less than a high school education (used as the base group). Additional independent variables reflecting farm management and production efficiency were also included. A binary variable, *Record*, denoted whether a farm was using financial recordkeeping.

The interaction variable *Eligible* equaled 1 when the farmer had off-farm income below \$500,000 and falls below the MILC production limit. Of course, farms above the production limit are still eligible to receive payments on the first 2.985 million pounds of milk. This variable provided us with a measure of those farms that were eligible for complete coverage of their production by the MILC program. This should correspond with the group of farmers that are expected to benefit most from the program—smaller farmers. In addition, operator off-farm wage income (*Off_Income_Op*) and spouse off-farm wage income (*Off_Income_Sp*) were included in the model.

The variables for off-farm income are important to the model from an eligibility standpoint, but also from the perspective of nonpecuniary benefits. Mishra and Goodwin (1997) demonstrated the relationship between off-farm labor and income stability. Those farmers with a greater preference for income stability are more likely to work off the farm. Similarly, a higher likelihood of participation in other government programs might be expected from these same farmers. A variable indicating whether a farmer is participating in the organic cer-

Table 2. Variables and summary statistics^{1,2}

Variable	Description	Mean	SD
<i>MILC</i>	1 if enrolled in Milk Income Contract Loss program; 0 otherwise	0.418	0.493
<i>M_Price</i>	Price of milk received by farmer (\$/kg)	0.366	3.446
<i>Op_Age</i>	Age of farm operator	51.476	11.200
<i>Off_Income_Op</i>	Income earned from off-farm labor of operator (\$)	2,473	20,287
<i>Off_Income_Sp</i>	Income earned from off-farm labor of spouse (\$)	8,666	17,178
<i>Op_Educ_C</i>	College education and beyond	0.212	0.409
<i>Op_Educ_H</i>	High school education and some college	0.609	0.488
<i>Op_Educ_B</i>	Less than high school education	0.179	0.384
<i>Small</i>	1 if <100 cows; 0 otherwise	0.438	0.496
<i>Medium</i>	1 if ≥100 cows but <300; 0 otherwise	0.289	0.453
<i>Large</i>	1 if ≥300 cows; 0 otherwise	0.273	0.446
<i>Record</i>	1 if survey information derived from farm financial records; 0 otherwise	0.909	0.288
<i>Org_Cert</i>	1 if received organic certification cost share subsidy; 0 otherwise	0.044	0.206
<i>Eligible</i>	1 if below production and off-farm income requirements; 0 otherwise	0.583	0.493
<i>Atlantic</i>	1 if farm in NASS ³ Atlantic region; 0 otherwise	0.355	0.479
<i>Western</i>	1 if farm in NASS Western region; 0 otherwise	0.183	0.386
<i>Midwest</i>	1 if farm in NASS Midwest region; 0 otherwise	0.357	0.479
<i>Plains</i>	1 if farm in NASS Plains region; 0 otherwise	0.047	0.211
<i>South</i>	1 if farm in NASS South region; 0 otherwise	0.058	0.234

¹Source: 2005 Agricultural Resource Management Survey: Dairy Costs and Returns Report (ARMS, 2005).

²Includes 1,793 dairy farm households.

³National Agricultural Statistics Service.

tification cost share subsidy program (*Org_Cert*) was therefore included as well. This program reimburses the dairy farm for up to 75% of the organic certification cost, thereby smoothing the cash flows of the farm business.

Statistical Methods

In our statistical model, we used the following specification to estimate the probability of participation in the MILC program:

$MILC = f(\text{Farm Size, Region, Op_Age, Off_Income_Op, Off_Income_Sp, Op_Educ, M_Freq, Record, Eligible, Org_Cert, M_Price})$.

The dairy farm operators in the sample were classified into 2 groups: those that reported receiving MILC payments (42% of sample) and those that reported otherwise. This classification allowed for the construction of a binary dependent variable Y (also known as *MILC*) that is used in modeling the MILC participation decision. To the extent that Y is a discrete variable, estimation of the determinants of MILC participation using ordinary least squares will result in biased regression parameters. To circumvent this issue, probit regression was used:

$$Y_i^* = \beta'X_i + \varepsilon_i \quad \varepsilon_i \sim N(0,1)$$

$$Y_i = 1 \text{ if } Y_i^* > 0 \text{ (the operator participates in MILC)}$$

$$Y_i = 0 \text{ if } Y_i^* \leq 0 \text{ (otherwise),}$$

[1]

where X is a matrix of explanatory variables and β is a vector of parameters to be estimated. Unlike the random variable Y_i ($i = 1, \dots, n$), which is observable, the variable Y_i^* is unobservable because it is derived from the farm operator's utility function (see Mishra et al., 2002; Chang and Mishra, 2011). The expected value of Y_i can be expressed in terms of the probability (P) of participating in the MILC program:

$$\begin{aligned} E[Y | X] &= P(Y_i = 1) \\ P(Y_i^* > 0) &= P(-\varepsilon_i < \beta'X_i). \end{aligned} \quad [2]$$

Because the probit model in [1] is associated with the standard cumulative distribution function $\Phi(\cdot)$, the parameter estimates are obtained by a maximum likelihood technique. This technique allows for the estimation of the probability ($\hat{P}_i$) that the i th farmer selects MILC participation over nonparticipation. The objective of the maximum likelihood technique here is to find the estimator $\hat{\beta}$ that maximized the likelihood of observing the pattern of participation in MILC observed in the sample:

$$\hat{P}_i = \Phi(\hat{z}_i) = \int_{-\infty}^{\hat{z}_i} \phi(u_i) du_i = \int_{-\infty}^{\hat{z}_i} (2\pi)^{-1/2} \exp(-u_i^2/2) du_i, \quad [3]$$

where $\Phi(\cdot)$ is the probability density function of the standard normal distribution and u_i is a random variable with mean zero, unit variance. In addition, the

Table 3. Probit estimates (marginal effects) of factors affecting farmers' participation in Milk Income Loss Contract program

Variable ¹	Marginal effect estimate ²	SE
<i>Op_Age</i>	0.002	0.003
<i>Op_Educ_C</i>	0.444***	0.108
<i>Op_Educ_H</i>	0.532***	0.090
<i>Org_Cert</i>	0.858***	0.165
<i>Small</i>	0.183	0.158
<i>Medium</i>	0.217*	0.121
<i>M_Price</i>	-0.034***	0.011
<i>Record</i>	0.615***	0.120
<i>Off_Income_Op</i>	-3.21E-06	3.36E-06
<i>Off_Income_Sp</i>	4.33E-06**	1.82E-06
<i>Eligible</i>	-0.083	0.114
<i>Atlantic</i>	0.137	0.148
<i>Western</i>	0.178	0.157
<i>Midwest</i>	0.190	0.148
<i>Plains</i>	0.158	0.196
Constant	-1.042***	0.324
Likelihood ratio chi-squared	101.12*** (0.000)	
Pseudo R ²	0.10	
Concordance (%)	63.8	
Number of observations	1,732	

¹Variables defined in Table 2. Large, medium, and small farms are those whose cows number ≥ 300 , 100–299, and < 100 , respectively.

²Marginal effects are calculated at the sample mean.

***, **, and * indicate significance at 1, 5, and 10% level.

variable $\hat{z}$ is equal to $\beta'X_i$. The probability density function (ϕ) and the estimated parameters $\hat{\beta}$ from [1] are then used to estimate the marginal effects (Greene, 2008):

$$\frac{\partial E[Y | X]}{\partial X} = \phi(\beta'X_i) \hat{\beta}. \quad [4]$$

The reported marginal effects were evaluated at the mean values.

RESULTS AND DISCUSSION

Table 3 provides the marginal effects estimated for the participation equation. First, the result of the Wald chi-squared test allowed us to reject the null hypothesis that all of the coefficients except for the intercept were simultaneously zero. Another indicator of the model's overall fit was the estimated value of McFadden pseudo-R² of 0.10 that, considering the cross-sectional nature of the data, points to the model's fair predictive capability. McFadden pseudo-R², which is suggested by McFadden (1973, p. 122), is a scalar measure that varies between 0 and 1 and is computed as follows:

$$\text{McFadden pseudo-R}^2 = 1 - \left[\frac{\ln L_A}{\ln L_0} \right],$$

where $\ln L_A$ is the value of the log-likelihood function when all the regressors are included in the estimation and $\ln L_0$ is the value of the log-likelihood function when regression is performed on the intercept only. This R² will take the value 0 (indicating poor fit) if the model predicted occurrence of the event no better than a simple flip of a coin, and will equal 1 if the model predicts the event perfectly (see Amemiya, 1981, p. 1505; Maddala, 1983, p. 39). A third indicator of the model's overall fit is the percentage concordance. This measure provides an indication of the model's overall quality by means of looking at the association between predictive probabilities and observed succession responses. This value was large (63.8%), thereby indicating that the probit regression model for MILC participation decision had reasonable predictive power.

The operator's educational attainment had a positive and significant effect on the likelihood of participation in the MILC program. The marginal effects of *OP_Educ_C* (0.44) and *OP_Educ_H* (0.53) indicated that compared with operators with less than a high school education, the probability of participation in MILC increased by 44% and 53% for farm operators with a college degree and a high school diploma, respectively. A possible explanation for this result is that educated dairy producers are more likely to read, process, and make sound decisions on farm programs. Huffman (1980) supports this by stating that education

enhances a farmer's ability to receive, interpret, and understand new information. Specifically, farmers are more likely to seek additional information on related issues, such as eligibility and timing of the program, which can maximize farm income as it relates to participation in government programs (Goodwin and Featherstone, 1995). The effect of *Org_Cert* on MILC participation was positive and statistically significant at the 1% level. We found that the probability of participation in the MILC program increased by 0.86 when farmers also participated in the organic program. Perhaps the income stabilization benefits of the program increased the likelihood of participation. In addition, a dairy farmer who is already familiar and participating in one government program may be more willing to participate in another out of familiarity. It can also be argued that organic dairy farms, compared with conventional dairy farms, have lower milk production levels (McBride and Greene, 2009). Compared with organic dairy farms, conventional dairy farms tend to feed and manage cows in such a way (e.g., using antibiotics and growth hormones) that increases milk production levels beyond the natural capacity of the cow.

The combination of low farm income and a strong nonfarm economy may encourage many farm operators and their spouses to work off the farm. Mishra and Goodwin (1997) found a positive relationship between farm income variability and off-farm work. Specifically, farm households working greater off-farm hours have been shown to have lower income volatility. Similarly, greater variability in farm income will induce the farm operator to participate increasingly in off-farm labor. If the coefficient estimate for *Off_Income_Sp* is positive and significant, then this indicates that farm households with spouses earning off-farm wages are more likely to participate in the MILC program. The marginal effect on *Off_Income_Sp*, although very small, is significant and should not be discounted. The small marginal effect could be associated with the fact that the dependent variable is binary and *Off_Income_Sp* is a continuous variable. One explanation may be that, like all farmers, dairy farmers prefer a more stable income (Mishra and Goodwin, 1997; Mishra et al., 2002) and off-farm income may provide stability to household income. It is plausible that dairy farms may be maximizing their total household income through off-farm income (a self-insurance activity) and government payments (participation in MILC).

The price of milk (*M_Price*) also played an important role in the MILC program participation decision; this might be self-evident as the program depends on milk price. Results in Table 3 indicate that the probability of participation in the MILC program decreased by 0.034 with a \$1 increase in the price of milk. We also found

significant evidence that medium-sized farms (100 to 299 cows) were more likely to participate in the MILC program. Brown et al. (2010) state that the size of the US average herd producing 2.985 million pounds (1.36 million kg) of milk is about 148 cows. This average "critical herd size" falls squarely in the middle of the interval defined in this study as medium-sized farms. Contrary to the established narrative of large dairy producers, evidence from our study suggests that medium-sized dairy producers are more likely than large dairy producers to participate in the MILC program.

Farm management strategies such as bookkeeping and financial records (*Record*) on farm income and expenditures are important determinants for the dairy producer's decision to participate in the MILC program. The coefficient for *Record* was positive and statistically significant at the 1% level. This indicates that farmers with detailed, written evidence of their farm's performance are more likely to participate in the MILC program. Specifically, the probability of participation increased by 0.62 for farmers keeping records. This result is consistent with the findings reported by Mishra and Morehart (2001). It can be argued that dairy producers keeping track of income and expenditures are more aware of their output levels, input costs, and expected profits. Hence, these farmers can easily make sound farm-management decisions. They are also more aware of where they stand in relation to the MILC program requirements and can easily determine both their need and eligibility.

Our results answer some questions regarding who is most likely to participate in the program. They also raise new questions about the effectiveness of the MILC program. First, are policymakers improving the welfare of their target group? Specifically, if they are trying to help smaller dairy farmers, why was the link between size and participation not stronger? Second, if farmers are indeed engaging in multiple behaviors with the intent of stabilizing income, then are any of the activities effective independently? Some behaviors, such as recordkeeping, are simply best management practices that all businesses should adopt. Others, such as participating in the organic certification cost share program and off-farm labor, are not widely applicable. The idea that farmers are using all of these techniques together raises the puzzling question of whether the programs are individually effective at stabilizing farm household income. Nonetheless, findings from this study suggest that off-farm labor markets are important to dairy farm households.

This study suggests that we can focus more attention on financial risk and management issues faced by farmers. In our sample, almost 10% of dairy farmers did not use financial recordkeeping. Financial record-

keeping aids the farm operator or manager in evaluating production, economic efficiency, and profitability. With a shift in government support, extension agents and researchers can develop educational materials to demonstrate the advantages of using financial record-keeping software. From the perspective of older dairy farmers, they need an accurate financial picture to assess retirement goals, exit strategies, and succession plans. Younger dairy farmers can benefit from having an accurate measure of long-term debt levels, liquidity, solvency, and profitability. Finally, with the current governmental budget deficit, farm programs will continue to receive significant scrutiny in discussions of the 2012 Farm Bill. Any reduction, restructuring, or elimination of the MILC program would significantly affect medium-sized dairy farms.

CONCLUSIONS

This research provides valuable information on the factors affecting farmers' participation in the MILC program. We found that more educated, organized, and financially astute farmers are more likely to participate in the MILC program. These findings provide further support for prescriptions in the literature that farmers should invest time and effort in financial management. Additionally, it has been argued that the MILC program is inefficient and rewards inefficiency by keeping high-cost, small dairy farms in business. However, contrary to the established narrative about large dairy producers, medium-sized dairy farms are more likely than large farms to participate in the MILC program.

ACKNOWLEDGMENTS

The views expressed here are not necessarily those of the Economic Research Service or the US Department of Agriculture. This project was supported by the USDA Cooperative State Research Education & Extension Service, Hatch project # 0212495 and Louisiana State University Experiment Station project # LAB 93872.

REFERENCES

- Amemiya, T. 1981. Qualitative response models: A survey. *J. Econ. Lit.* 19:1483–1536.
- ARMS (Agricultural Resource Management Survey). 2005. Dairy Costs and Returns Report. Economic Research Service, USDA, Washington, DC.
- Brown, S., B. Cropp, B. Gould, and E. Jesse. 2010. Dairy policy issues for the 2012 Farm Bill. Food and Agricultural Policy Research Institute (FAPRI), Columbia, MO.
- Bryant, H. L., J. Outlaw, and D. Anderson. 2007. Aggregate milk supply response to the Milk Income Loss Contract program. *J. Agribus.* 25:133–146.
- Chang, H. H., and A. K. Mishra. 2011. Does the Milk Income Loss Contract program improve the technical efficiency of US dairy farms? *J. Dairy Sci.* 94:2945–2951.
- Chite, R. M. 2007. Dairy policy issues. CRS report for Congress, Congressional Research Service, Washington DC.
- Cox, T., and J. Chavas. 2001. An interregional analysis of price discrimination and domestic policy in the U.S. dairy sector. *Am. J. Agric. Econ.* 83:89–106.
- Dairy Policy Analysis Alliance. 2010. Dairy policy issues for the 2012 Farm Bill. Food and Agricultural Policy Research Institute (FAPRI), University of Missouri-Columbia, Columbia, and the Department of Agricultural and Applied Economics, University of Wisconsin-Madison, Madison.
- Goodwin, B. K. G., and A. M. Featherstone. 1995. An empirical analysis of participation in US government farm programmes. *Appl. Econ.* 27:39–50.
- Gould, B. W., and J. H. Hackney. 2003. Enrollment in the 2003/2004 MILC program: Does timing matter? Marketing and Policy Briefing Paper no. 82. University of Wisconsin-Madison Cooperative Extension, Madison.
- Greene, W. 2008. *Econometric Analysis*. 6th ed. Pearson Education Inc., Upper Saddle River, NJ.
- Helmberger, P., and Y. Chen. 1994. Economic effects of U.S. dairy programs. *J. Agric. Res. Econ.* 19:225–238.
- Herdon, C., B. Davis, and G. Parkhurst. 2005. Does the MILC program affect milk supply response across regions for the U.S.? Selected paper presented at the American Agriculture Economics Association Annual meetings. Providence, Rhode Island.
- Huffman, W. E. 1980. Farm and off-farm work decisions: The role of human capital. *Rev. of Econ. Stats.* 62:14–23.
- Jesse, E. 2005. Dairy policy in the next farm bill: An early assessment. Marketing and Policy Briefing Paper no. 89. University of Wisconsin-Madison Cooperative Extension, Madison.
- Jesse, E., R. Cropp, and B. W. Gould. 2008. Dairy Subtitle: Food, Conservation, and Energy Act of 2008. Market and Policy Briefing Paper, Dept. of Agricultural and Applied Economics, University of Wisconsin-Madison Cooperative Extension, Madison.
- Maddala, G. 1983. *Limited-Dependent and Qualitative Variables in Econometrics*. Cambridge University Press, Cambridge, MA.
- McBride, W. D., and C. Greene. 2009. Characteristics, costs, and issues for organic dairy farming. Economic research report 82. USDA, Washington, DC.
- McFadden, D. 1973. Conditional Logit Analysis of Quantitative Choice Behavior. Pages 105–142 in *Frontier of Econometrics*. P. Zarembka, ed. Academic Press, New York, NY.
- Mishra, A. K., H. S. El-Osta, M. J. Morehart, J. D. Johnson, and J. W. Hopkins. 2002. Income, Wealth, and the Economic Well-Being of Farm Households. Economic Research Service, AER-812. USDA, Washington, DC.
- Mishra, A. K., and B. K. Goodwin. 1997. Farm income variability and the supply of off-farm labor. *Am. J. Agric. Econ.* 79:880–887.
- Mishra, A. K., and M. J. Morehart. 2001. Factors affecting returns to labor and management on U.S. dairy farms. *Agric. Fin. Rev.* 61:123–140.