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**Willingness to Participate in Dairy Programs to Reduce Manure Related Problems
in Louisiana's Major Dairy Production Region**

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Selected Paper prepared for presentation at the
Southern Agricultural Economics Association Annual Meetings
Orlando, Florida, February 5-8, 2006

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Willingness to Participate in Dairy Programs to Reduce Manure Related Problems in Louisiana's Major Dairy Production Region

Abstract

This study uses a cheap talk method to elicit the value for willingness to accept payment to participate in the milk diversion program or the dairy termination program. It compares the participant's participation and amount they received from 20 years ago (MDP program of 1984-85) to the hypothetical WTP if the programs were to be instituted today. Logistic and tobit models were used to understand the factors affecting dairy program participation and stated bid values by respondents. Results indicated that past participation is the key variable in regression. Bootstrap result confirms that most of the estimated parameters fall within the range of bootstrap confidence interval.

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Several ways have been suggested to control point and nonpoint sources of pollutions in the United States. Point sources can be regulated fairly easily either through command and control approaches or market mechanisms (taxes, quotas, marketable permits) because they are visible, tangible and site specific. Conversely, it is difficult to regulate nonpoint sources of pollution as they lack those readily recognizable and documentable characteristics. The adoption of best management practices has been one of the most prominent means used by the USDA/Natural Resource Conservation and U.S.

Environmental Protection Agency (EPA) to encourage farmers to control nonpoint source pollution. However, adoption rates of best management practices have not been at levels necessary to achieve the desired pollution reduction objectives. Farmers perceive that the adoption of BMPs reduce profits and generate public goods, but at their net private expense (Kim *et al.*; De Vuyst and Ipe). Regulators view agricultural operations such as dairy farms as creators of negative externalities which, if left unregulated, would create severe water quality problems.

Dairy farms in Louisiana's Florida Parishes can be considered to be both point and nonpoint sources of pollution. Concentrated Animal Feeding Operation (CAFO) and Total Maximum Daily Load (TMDL) programs may be able to reduce environmental problems associated with dairy production. However, the current size of the typical Louisiana dairy farm is too small for it to be subject to CAFO regulations. In addition, the

majority of Louisiana dairy farms are pasture based operations which render CAFO regulations even less relevant.

The pollution attributable to dairy farms however is serious enough to warrant sanctions if not addressed and reduced in tangible and meaningful ways. One possible alternative for reducing the pollution problems attributable to dairy farms is to reduce the number of dairy cows in the area. This is an extreme measure as it would also reduce the milk supply which has implications for participating producer incomes and economic activity in their communities. Past programs, the dairy termination program (DTP) of 1986 and the milk diversion program (MDP) of 1984-1985, were voluntary and entailed reductions in cow numbers. The DTP required the total elimination of all cows on a participating farm while the MDP resulted in only a fraction of the cows being eliminated from the farm. These programs were implemented to achieve the explicit policy objective of reducing milk production so as to minimize the cost of the dairy price support program while boosting producer incomes through higher milk prices. The reduction in dairy manure and thus pollution was an unintended side benefit. The efficacy of voluntary programs in reducing cow numbers for the explicit purpose of minimizing pollution can be assessed as one alternative for minimizing the negative environmental impacts of dairy manure in Louisiana's major dairy region.

Dairy farmer participation is a key to success of dairy programs. A voluntary program to reduce cow numbers may be an attractive option for economically struggling dairy farmers. This study seeks to create information as to whether dairy farmers in Louisiana's major region of milk production would be willing to participate in a voluntary program that would reduce cow numbers. Specifically, it seeks to determine

whether they would favor a program similar to a dairy termination program that required exit or whether they favor a program similar to the milk diversion programs which required a reduction in cow numbers, but not exit. The study sought to determine dairy farmer required levels of payment for participation in the different programs. The study also sought to determine the response of dairy farmers in Louisiana's major milk production area to participation in the 2003 Cooperatives Working Together (CWT) program and their future intentions for their labor and dairy farm following CWT selection.

The study uses a contingent valuation survey with a cheap talk method to obtain plausible values from dairy farmers if a voluntary program to reduce cow numbers were to be offered for the express purpose of minimizing the environmental problems associated with dairy manure in the region.

The objectives of this study are:

- i) To assess levels of dairy farmer participation and payments in the two milk supply reduction programs implemented in the mid -1980s and their willingness to participate in similar programs in the future,
- ii) To ascertain bid values necessary to attract dairy farmer participation in a future voluntary milk supply reduction program with features similar to a DTP, MDP or 2003 Cooperatives Working Together (CWT) program, and
- iii) To identify factors most likely to impact a program participation decision by Louisiana dairy farmers.

Milk Reduction Programs and Their Effect

The three programs identified above were all voluntary and designed to reduce the milk supply by reducing the number of cows so as to increase milk prices at the farm and reduce burdensome surpluses. These programs are of interest to individuals concerned with minimizing pollution attributable to dairy manure because reductions in cow numbers automatically reduce the quantities of manure in the environment. Program features differ enough to merit concern as to which program might be most appealing to Louisiana dairy farmers. The characteristics of farmers relative to their willingness to participate in a particular program and their required level of payments for participation are pieces of information critical to the design of effective and efficient programs for minimizing pollution attributable to dairy manure. Details regarding program features are instructive.

Milk Diversion Program (MDP): This voluntary program was the first to be implemented by the Federal government in (1984 – 1985). It provided participating farmers with a fixed and known ten dollar per hundredweight (\$10/cwt) payment in exchange for contracted reductions in their milk marketings of from 5 to 30 percent. Participating farmers made these reductions by culling their least productive cows first such that the percentage of cows culled exceeded their contracted levels of milk marketings. Because the least productive cows were culled first, farmers tended to experience lower average variable costs of production from their remaining cows. In combination with the \$10/cwt payments, greater net returns were realized. The program did not work as fully expected in reducing milk production because higher producing cows were retained and acquired by non-participating dairymen. The program also provided dairymen who were planning

to retire with windfall payments. While the program was not necessarily effective in reducing total milk production, it did have the effect of reducing manure pollution through reductions in dairy cow numbers. Because the explicit policy objective of reducing total milk production was not sustained, the Dairy Termination Program (DTP) was implemented.

Dairy Termination Program (DTP): The DTP program was implemented under the provisions of the Food Security Act of 1985. It provided for dairy farmers to submit sealed per hundredweight bids for which, if the bid were accepted by the U.S. Secretary of Agriculture, they would agree to completely exit dairy farming for a period of five years and all female dairy animals on their farms would either be sold for slaughter or export. In exchange, those farmers would be paid their bid price for their annual historical level of milk production. Their payment for participation would include the DTP payment and the receipts from the sale of all of their female animals. This program was more effective in reducing total milk production because it removed all cows from the U.S. inventory and not just the least productive cows. It, too, reduced manure production and minimized pollution problems. The government sponsored programs were not repeated, but a voluntary private program was instituted to reduce milk production under a Cooperatives Working Together (CWT) program.

Cooperatives Working Together (CWT): The CWT program was developed by the National Milk Producers Federation (NMPF), a federation of milk producers headquartered in Washington, D.C. The objective of the CWT program is to increase the milk prices received by dairy farmers by reducing the domestic supply of milk. The CWT program is funded by a \$.05/cwt voluntary contribution from dairy farmers and it is

completely administered by the NMPF. It seeks to reduce the milk supply through whole herd retirements, reduced milk marketing and export assistant program. The targeted amount of milk reduction is about 1.2 billion pounds (Anonymous, 2006a). The locales of selected whole herd retirements are targeted according to parameters established by the NMPF. The relative merits of the CWT as it impacts upon large versus small dairy farms and areas of the country are not of interest in this paper. This paper recognizes that these reductions in cow numbers minimize the pollution attributable to dairy farms.

Gale studied the characteristics of DTP participants in North Carolina and Virginia to determine if human capital and lifecycle variables had any effect on farmers' willingness to quit dairying. Older and less experienced farmers whose children are not likely to continue dairy farming were found to be more willing participants in a dairy termination program.

Knight and Kubiak evaluated the consistency in the formats of the templates developed by extension economists in different states to help farmers in formulating their dairy termination program decisions. Because of the inconsistencies observed in formats across states, some farmers may have submitted bids lower than warranted by their economic condition resulting in their acceptance into the dairy termination program. Therefore, bid value submitted play an important role in participating the dairy termination program.

Dairy termination program increased the red meat supply generating a price shock in the red meat market during its eighteen month implementation period (Marsh). However, its long term effect on the milk supply was deemed ineffectual (Dixon, Susanto, and Berry). The milk diversion program was assessed as having had a short term

impact on the milk supply. The effect of these two programs on the milk supply was not consistent throughout the top twenty-one milk producing states. Work by Bausell, Belsley and Smith indicated that the MDP and DTP programs were less effective in reducing costs to consumers and government than a lower support price. Zepeda indicated that the dairy termination program may eventually result in the existence of only large dairy farms in the U.S.

All these studies have left an important impact of dairy programs, i.e., increase in environmental quality due to reduction in dairy numbers. Our study addresses this void in literatures by viewing dairy number reductions through the lenses of a pollution reduction measure in an impacted watershed.

Data and Methods

Data were collected from a survey sent to all 344 Louisiana dairy farms using a mail survey following the tailored designed method (Dilman). The survey contained four sections: Dairy Manure Disposal, the Dairy Termination Program (DTP), the Milk Diversion Program (MDP) and BMP adoption. The DTP and MDP sections were designed to evaluate the effectiveness of these policy instruments in reducing cow numbers as a means of minimizing the negative environmental impacts of cow manure. The BMP adoption section was designed to assess the willingness of respondents to pay to enhance the cow carrying capacity of their land without compromising the environment, and to identify the demographic characteristics of willing payers.

Surveys were mailed on the first of May in 2004. Follow-up surveys were mailed to nonrespondent three weeks after the first mailing. Two weeks after mailing the follow-

up survey, a reminder post card was mailed to each nonrespondent. In addition, telephone contacts were made to encourage responses. Only 49 surveys were received for a response rate of 14.24%. The low response rate reflects several aspects of current dairy production. The industry is in decline in Louisiana and some farmers on the mailing list were either out of business or had retired. In conversation with the farmers, many expressed a feeling that they were being constantly surveyed and were tired of the process. Several farmers felt that nothing good ever came out of such surveys because “the price for their milk just keeps falling”.

Analyses of the data collected were done using logit and tobit models. Tobit models were used to identify the important socioeconomic characteristics of participants affecting their willingness to participate in the past and present milk supply control programs. Identifying the factors affecting the willingness to participate and the bid level in the 2003 CWT is of particular interest.

Consider a continuous random variable y . The dependent variable is the dairy farmer's reported bid value. Since it cannot be less than zero, the bid values take on the form of a truncated normal distribution. This makes the tobit model the best tool of analysis. The model can be formulated as follow:

$$Y_i^* = a_0 + a_1 * PP + a_2 * M + a_3 * I + a_4 * R + a_5 * E + a_6 * Age + e_i$$

$$Y_i = 0 \quad \text{if} \quad Y_i^* \leq 0$$

$$Y_i = Y_i^* \quad \text{if} \quad Y_i^* > 0$$

With this model, Y is a dependent variable that takes a value of 1 if an individual farmer participates in the program and a value of 0, otherwise. If the responding farmer reports CWT participation, there is a follow-up question to assess his/her willingness to accept the bid value. Most survey respondents would know the previously accepted upper level

bid value of \$22.50/cwt under the DTP and the fixed \$10/cwt payment under the MDP.

Given this information and the fact that the hypothetical bias is minimized through use of the cheap talk method, the expectation is for survey values at which respondents would be willing to participate in a program designed to reduce cow numbers would be close to the historical DTP value.

Model variables include: PP is Past Program Participant, M is dairy cooperative member, debt is debt-to-asset ratio, income is percentage of income from dairy, reasons identifies the specific reason(s) cited by respondents for their likely DTP or MDP participation today, and age is number of years on a dairy farm.

A logistic regression analysis of farmers' decisions to participate in milk reduction programs was also conducted. It was followed by a tobit model to assess the bid values given by survey respondents and used in the logistic regression model. The validity of parameters estimated from logistic regression was evaluated by using 1,000 bootstrap replications.

Results

Hypothetical bias is a serious problem when attempting to collect willingness to accept values. A cheap talk method is supposed to reduce this hypothetical bias. This study uses a cheap talk method using a CV survey to elicit willingness to accept bid values to participate in these programs. The cheap talk format used in this survey is shown in Appendix 1 along with the set of questions asked to assess respondent's participation in the three milk supply control programs. Respondents were provided with past bid values so that there was a common set of starting reference values. Although this may have had

an anchoring effect, it should bring the stated values closer to the true value. Willingness to accept values were elicited for respondents' participation in MDP, DTP and 2003 CWT programs. None of the survey respondents had been accepted into the 2003 CWT program. Their average bid value was found to be \$15.50/cwt. This value lies between the mid-1980s MDP and DTP values of \$10/cwt. and \$22.50/cwt., respectively. Most respondents would "continue to farm full time but not dairy" and "seek nonfarm employment" if their CWT bid had been accepted. These responses suggest that a significant number of CWT participants would exit dairy and even production agriculture if given the opportunity. Only one respondent indicated a willingness to be continually involved in milk production. Among respondents, many had been MDP participants. Only one indicated DTP participation. The majority of MDP respondents had contracted out 10% of their milk production. Twenty-eight percent (28%) of the survey respondents indicated a willingness to participate in another MDP program. The minimum average payment required by these respondents to participate in the program was \$18.37/cwt. This value is 183.7% above the \$10/cwt payment in the earlier MDP of 1984-85. Given the effects of inflation over this 20 year time period, this value is perhaps not overstated by the respondents. Respondents also indicated a willingness to reduce their total milk production on average by 49%. Respondents indicated a willingness to enter into a DTP at a price of \$24.05/cwt. This value is comparable to the \$22.50/cwt upper DTP value in 1986). The main reason given by many respondents for their willingness to participate in another DTP or MDP was their perception that the future for dairying in Louisiana did not appear bright. Descriptive statistics from the data used is provided in Table 1.

A logistic regression model was estimated using all the stated variables in equation 1. However, the likelihood value did not improve and there was a problem with an optimization model. Accordingly, a model selection procedure was used to identify the best fitting model which included only three variables. Results for the final model are shown in Table 2.

Results indicated that only variables associated with the respondents' participation in the milk diversion program had a significant positive marginal effect. Years in dairying was negatively associated with participation in a milk reduction program. This is not new because if a farmer has been in the farming profession for a long time then he is likely to continue producing dairying. The proportion of total income derived from dairy farming had a positive, but insignificant sign associated with milk program participation.

The odds ratio column gives the amount of change expected in the odds ratio when there is a one unit change in the predictor variable when all other variables in the model are held constant. An odds ratio close to 1.0 suggests that there is no change due to the predictor variable (Anonymous, 2006b). Income from and years in dairy farming are continuous variables. The odds ratio indicated that a 1% increase in the income share from dairying increases the chance of dairy program participation by 1.5 percent. A farmer highly dependent on dairy farming for income is indicative that the farmer wants to get out of dairy farming because of the perception that the future for dairying in Louisiana is not bright. A year spent dairying is likely to decrease the farmer's willingness to participate in a milk reduction program by 1.4 percent. The longer the farmer dairies, the less likely he would participate in a milk reduction program. Past program

participation increases the likelihood of participating in a milk reduction program in the future. Study findings suggests that a past program participant is six times more likely to participate in a dairy program than the farmer who has never participated in such a program.

Bootstrap results based on 1,000 replications indicated that two out of three parameters failed within the 90 percent confidence interval. This indicates that the parameters estimated in this regression are fairly representative of the population.

Willingness to accept bid values were analyzed using a tobit regression model. Results are shown in Table 3. Similar to the logistic model, only past participation had a significant effect on bid values.

Conclusions

One of the ways to reduce nonpoint source related pollution in Louisiana's major dairy production region is to reduce cow numbers. A dairy cow reduction program may be an attractive option for dairy operations facing low milk price, increasing production cost and increasing competition from imported milk supplies. Dairy producers' willingness to participate in three different milk supply reduction programs was analyzed. The values obtained from the survey to determine levels of payments necessary to attract participants in a future milk supply reduction program were comparable to the values paid for MDP and DTP participation in the 1980s. It was observed that the willingness to accept payment values were close to the real value. This phenomenon was thought to be attributable to the identified reference points provided to survey respondents. The possibility of an anchoring effect was recognized, but its provision of values close to the

reality suggests that the cheap talk method of eliciting bid values may be minimizing a hypothetical bias. Results indicated that only past participation in the similar program is a significant factor in determining future participation in milk program. Coefficients estimated from logistic regression were also validated through a bootstrap simulation procedure. Two of the three parameters estimated fell within the bootstrap confidence interval proving the validity of the results. Results should prove helpful in designing policy options for pollution reduction from dairy manure.

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Table 1. Descriptive Analysis

Variables	N	Mean	Std Dev	Minimum	Maximum
Program participation					
(Yes=1, 0 otherwise)	49	0.265306	0.446071	0	1
Bid values	44	5.011364	8.604683	0	25
Estimated net income	39	3.128205	1.301406	1	6
Why participating in Milk					
Diversion Program	28	1.535714	0.838082	0	3
Participation in the past					
(Yes=1, 0 otherwise)	49	0.142857	0.353553	0	1
Number of years in dairy	49	31.22449	11.13341	7	55
Bidded to participate in the					
CWT program (Yes=1, 0					
otherwise)	47	0.06383	0.247092	0	1
Post-CWT	16	2.875	1.360147	1	5
Member of a dairy					
cooperative					
(Yes=1, 0 otherwise)	49	0.918367	0.276642	0	1
Income from dairy	49	32.18571	34.61137	0	100
Debt to asset ratio (1 if D/A is					
less than 20 percent, 0					
otherwise)	49	0.530612	0.504234	0	1

Table 2. Logistic Regression Results and Confidence Interval of the Estimated Parameters Resulting from 1,000 Bootstrap Replications

Variables	Estimate	p-values	Odds-Ratio	Marginal Effect	Bootstrap 90% lower CI	Bootstrap 90% upper CI
Intercept	-1.4449	0.1576				
Income from dairy	0.0148	0.1477	1.015	0.002541	0.0148	0.0160
Years as a dairy farmer	-0.0137	0.6566	0.986	-0.00235	-0.016	-0.0125
Past program participation	1.8137	0.0429	6.133	0.310668	1.9524	2.2746

Table 3. Tobit Regression Results

Variables	Estimates	P- values	Marginal Effect	90% Lower	90% Upper
				Confidence Level	Confidence Level
Intercept	-16.4991	0.2178		-42.7363	9.738
Income from Dairy	0.143	0.2938	0.14	-0.124	0.41
Years as a dairy farmer	-0.1407	0.7181	-0.14	-0.9047	0.6233
Participation in Milk Program in the past	20.441	0.0679	20.44	-1.5005	42.3826
Scale	22.6118	5.5771		13.9441	36.6674

Appendix 1

SECTION III. MILK REDUCTION PROGRAMS

Please read the following paragraphs before you answer the questions in this section.

Some consider dairy farms in Louisiana's Florida Parishes to be both point and nonpoint sources of pollution. This means there are two possible alternatives for minimizing pollution problems attributable to dairy farms. The first alternative is to reduce the number of dairy cows in the area. The second alternative is for dairy farmers to adopt the maximum number of applicable best management practices (BMPs) to minimize the negative environmental problems attributable to dairy farms .

The dairy termination program (DTP) of 1986 and the milk diversion program (MDP) of 1984-1985 were implemented to reduce the amount of milk produced by reducing the number of dairy cows. The purpose of these programs was to reduce milk production so as to raise milk prices and reduce the costs of the dairy price support program to the government. Similarly, the amount of manure being produced can be reduced by decreasing the number of cows. In the DTP, the producer submitted a bid price per hundredweight of milk for which the producer agreed to slaughter or export all female dairy animals and to exit milk production for at least five years. All bids of \$22.50 or less per hundredweight of milk were accepted. In the MDP, the producer entered into a contract with the government to reduce milk production 5 - 30% from some base period level of production in exchange for a payment of \$10.00 per hundredweight for an 18-month period. Since the rational producer would cull the lowest producing cows first, a participating producer would cull a percentage of cows that was higher than the contracted percentage of production. Both programs had the effect of reducing cow numbers, which reduced the total milk supply, put upward pressures on milk prices and reduced surplus stock levels. It follows that any reductions in cow numbers will reduce the volume of cow manure and its contribution to water pollution and phosphorous buildup in the soil.

The second alternative is to promote best management practices (BMPs) that minimize water quality deterioration from dairy production. Since 1996, USDA has used the Environmental Quality Incentive Program (EQIP) to assist farmers in adopting BMPs. Adopting BMPs allows dairy producers to simultaneously produce milk and be more environmentally responsible because BMPs reduce both point and nonpoint sources of pollution in water bodies. Dairy farmers have many BMPs available under EQIP, and the BMPs vary in their suitability by farm. Generally, the USDA helps share the cost of implementing various BMPs with the dairy producer. The cost share from the USDA under EQIP could be up to 75%, depending upon land quality, proximity to water bodies, and other unique attributes of the dairy farm. Limited resource farmers or first-time farmers potentially qualify for up to a 90% cost share. The contracts for BMPs under EQIP last for 1-10 years.

When requesting hypothetical values for participating in a milk reduction program or cost sharing in a BMP, previous research indicates that respondents over-estimate the amount they are willing to accept to participate in a supply control program and underestimate the amounts they are willing to pay to cost share in a BMP. If your responses are not well thought out, policy makers would most likely ignore the responses and look at industry cost levels or benefit data in establishing cost share values for the various BMPs. Therefore, it is imperative that you respond with values you believe to be true for you today, not historical values from other programs .

Now, we would like to ask you a series of questions regarding your participation in supply control programs and in cost sharing BMP initiatives.

1. Did you participate in the Milk Diversion Program or the Dairy Termination Program in the past?

Milk Diversion Program (MDP) (1984-85)	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Dairy Termination Program (DTP) (1986)	<input type="checkbox"/> YES	<input type="checkbox"/> NO

If YES, what was the minimum amount you bid to participate in the DTP (that is, to stop producing milk for at least five years, and to slaughter or export all of your female dairy animals)? \$ _____ per cwt milk. What was the maximum contraction in milk production you agreed to under the MDP for the \$10 per hundredweight payment ? _____ %.

2. Would you consider participating in a Milk Diversion Program (MDP) if it were offered today?

☐ YES

☐ NO

If YES, what is the minimum payment you would be willing to accept to reduce your milk production? \$ _____ per cwt milk.

For that payment, what is the maximum percent you would be willing to reduce your milk production? _____ %. What percentage of your cow herd would be culled to achieve this rate of reduction? _____ %.

What would you bid to participate in a Dairy Termination Program today? \$ _____ per cwt milk.

3. What reasons contributed to your willingness to participate in a DTP or MDP today? Check all that apply.

☐ Dairy operation is not profitable.

☐ Dairy operation is reasonably profitable, but the future for dairying in Louisiana does not appear bright.

☐ I am of retirement age.

☐ Other (Specify) _____

4. Did you submit a bid to participate in the August 2003 CWT program? ☐ YES ☐ NO

If YES, how much did you bid? \$ _____ per cwt milk.

Was your bid accepted? ☐ YES ☐ NO

5. What would have you done if your August 2003 CWT bid had been accepted and you had to exit the dairy industry?

☐ Retire from full-time farming

☐ Continue to farm full-time, but not dairy

☐ Continue to farm part-time, but not dairy

☐ Seek nonfarm employment

☐ Other (specify) _____