Regional and Structural Impacts of Alternative Dairy Policy Options

AFPC Working Paper 06-3

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Agricultural and Food Policy Center

The Texas A&M University System

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Milk and dairy product prices have fallen to their lowest levels in 3 years following the record highs of 2004 and 2005. The large government stockpiles of non-fat dry milk are gone, but threaten to build again as non-fat dry milk and cheese prices decline nearer the support price level.

A new farm bill is scheduled to be written in 2007. The Milk Income Loss Contract (MILC) program included in the last farm bill was only authorized through September 2005. Subsequent legislation reinstated the MILC program through August 2007. WTO negotiations are on-going and could influence U.S. farm programs [1/]. Dairy's role in the U.S. amber box limit of $19.1 billion may necessitate some possible trade-offs with other commodities. Dairy counts about $4.2 billion toward the annual amber box limit, but actual spending only averages about $1 billion (Outlaw, et al).

The pressure of low prices, WTO negotiations, MILC continuation, and a new farm bill has created the potential for a number of options and alternatives for dairy policy.

This paper examines the regional and structural impacts of 3 dairy policy options: MILC continuation, a target price/deficiency payment program, and an increase in the support price. All three options are designed to spend $400 million in amber box payments per year. The analysis uses representative dairy farms in major milk producing regions of the country developed by the AFPC for policy analysis.

Options

Three dairy policy options are analyzed. They are:

- MILC continuation. This option maintains the current payment limit at 2.4 million pounds per year.
- A Target Price/Deficiency Payment. In this option, payments are not limited to 2.4 million pounds in the MILC program.
- An increase in the Dairy Price Support Program to a level to spend $400 million per year.

The aggregate, or sector level analysis was estimated by FAPRI (Brown). Milk prices, by state for each option, are contained in Table 1. These milk prices are used to analyze the policy options at the farm level. The FAPRI dairy model is a stochastic model, meaning that the model is run through 500 iterations, generating 500 possible outcomes for each year. In that way, a distribution of price outcomes is created. Those prices are used in FLIPSIM to model the impacts of the policy alternatives on representative dairy farms.

[1/] As of this writing, little to no progress has been made following the collapse of the negotiations as the deadlines passed.

The Farm Level Income and Policy Simulator (FLIPSIM) model is a Fortran-based computer simulation model that simulates the annual economics activities of a farm, using accounting equations, identities, and probability distributions. FLIPSIM is recursive in that the information for asset values, debts, costs, machinery complement, family living, and off-farm income in the previous year (t-1) is used as input data to calculate values for the current year (t). At the end of each year, the model updates these lagged values and prepares to repeat the equations for the next year. After simulating the last year in the planning horizon, all variables are reset to their initial values to insure that the next iteration begins with the same assumptions about the farm and the exogenous data. The output from FLIPSIM is the variables that make up an income statement, cashflow, balance sheet, and financial ratios for describing the economic viability of a farm. When the model is run using stochastic yields and prices, FLIPSIM calculates empirical probability distributions for the key variables in the income statement, cashflow, and balance sheet.

Representative Dairy Farms

The AFPC has developed and maintains 23 representative dairy farms in major milk producing areas. The data used to describe the representative dairies are developed using a consensus building process of interviewing a panel of area producers. Data on number of milk cows, milk production, herd turnover, and production expenses are elicited from the producers. Other production data including size of farm, crops grown and feed rations are also developed with input from the panel. Production costs from the dairy to the farming operation (if any) are also developed within this consensus process.

The data are entered in FLIPSIM and the model is run to develop a first draft of 10 year financial projections. That draft is then validated by the panel of producers as being a good representation of the farm.

The location of the representative dairy farms is contained in Figure 1.

Figure 1. Locations of AFPC Representative Dairy Farms

Results

The results for the 23 representative dairy farms maintained by the AFPC are presented in Table 2. The results are measured using net cash farm income (NCFI). Averages over the 2008-2013 periods are reported. The coefficient of variation (CV) is used to measure the NCFI risk associated with each policy. A representative farm's preference for a policy is based solely on the highest NCFI in this analysis.

Income

Table 2 contains the average NCFI for the 2008-2013 period, the average NCFI for 2008 and 2013, and the CV of the average NCFI over the period for each scenario on each farm.

The average NCFI and CV is denoted with a superscript A, B, or C. NCFI's and CV's for each alternative program are compared with each other. Scenarios with the same superscript letter denote no statistically significant difference between the alternatives. For example, NCFI under each program for the California dairy (CAD 1710) are denoted with a different letter. The different letters indicates that each NCFI is significantly different from the others.

Overall, 19 of the 23 representative dairies would prefer the DPSP alternative, based on NCFI. That means that this option generated the highest annual average NCFI over the 2008-2013 period for all but four of the farms. NCFI under the DPSP was statistically different from the other two alternatives for 19 of the farms.

The results were more mixed for the other two alternatives. MILC ranked first for 4 of the farms: Vermont with 134 cows (VTD134), Missouri with 85 cows (MDD85), Wisconsin with 145 cows (WID145), and the Central NY with 110 cows (NYCD110). MILC ranked 2nd with 3 dairies and 3rd with 16 of dairies. None of the farms ranked the TP/DP option first. The TP/DP option generated the second highest average NCFI on 16 of the dairies, while ranking 3rd on 7 of the dairies.

Table 1. U.S. and State All-Milk Prices Under 3 Alternative Dairy Policies.

	2008	2009	2010	2011	2012	2013
U.S. All-Milk						
MILC	13.30	13.43	13.55	13.56	13.62	13.65
TPDP	13.36	13.47	13.57	13.57	13.63	13.65
DPSP	13.96	13.89	13.85	13.88	13.85	13.83
California						
MILC	12.11	12.24	12.37	12.39	12.46	12.49
TPDP	12.17	12.28	12.39	12.40	12.46	12.50
DPSP	12.80	12.72	12.69	12.72	12.69	12.68
Florida						
MILC	16.72	16.87	17.00	17.04	17.11	17.16
TPDP	16.77	16.90	17.02	17.05	17.12	17.16
DPSP	17.32	17.27	17.26	17.31	17.30	17.29
Idaho						
MILC	12.40	12.54	12.67	12.70	12.77	12.81
TPDP	12.45	12.57	12.69	12.72	12.78	12.82
DPSP	13.03	12.98	12.96	13.01	13.00	12.99
Missouri						
MILC	13.63	13.78	13.91	13.94	14.01	14.05
TPDP	13.69	13.81	13.93	13.95	14.02	14.06
DPSP	14.28	14.22	14.20	14.24	14.23	14.21
New Mexico						
MILC	12.47	12.62	12.74	12.77	12.84	12.88
TPDP	12.53	12.66	12.77	12.78	12.84	12.89
DPSP	13.15	13.09	13.06	13.10	13.08	13.06
New York						
MILC	13.70	13.85	13.97	14.00	14.07	14.11
TPDP	13.76	13.88	13.99	14.01	14.08	14.12
DPSP	14.37	14.31	14.28	14.32	14.30	14.29
Texas						
MILC	13.54	13.69	13.82	13.84	13.91	13.95
TPDP	13.60	13.73	13.84	13.85	13.92	12.96
DPSP	14.22	14.16	14.13	14.17	14.15	14.13
Vermont						
MILC	14.04	14.19	14.31	14.34	14.41	14.45
TPDP	14.10	14.22	14.33	14.35	14.41	14.46
DPSP	14.71	14.65	14.62	14.66	14.64	14.63
Washington						
MILC	13.16	13.30	13.42	13.44	13.51	13.55
TPDP	13.22	13.34	13.45	13.45	13.52	13.56
DPSP	13.87	13.80	13.76	13.80	13.77	13.75
Wisconsin						
MILC	13.80	13.94	14.07	14.11	14.18	14.22
TPDP	13.86	13.98	14.09	14.12	14.19	14.23
DPSP	14.43	14.38	14.37	14.42	14.40	14.39
Government Payments						
MILC	0.2473	0.2229	.01715	0.1764	0.1736	.01769
TPDP	0.6080	0.5564	.05108	0.5040	0.4705	.04600

For the moderate size Vermont dairy, there was no statistical difference between the MILC and DPSP alternatives. However, looking at the individual years it presents a different picture. On average, the MILC option generated higher NCFI by only $1,030 per year than did the DPSP. The DPSP generated $5,560 more NCFI in 2008 than did the MILC option. By the end of the period MILC generated $5,460 more in NCFI. The other 3 dairies that preferred the MILC option had similar patterns.

This clearly illustrates that smaller dairies benefit from MILC while large dairies do not. In the case of large dairies, the dollars received from the MILC program are more than offset by lower milk prices. The payment limit part of the MILC is continued in this policy alternative, maintaining the positive effect for small dairies.

In each case where the dairies preferred the MILC option, the DPSP option was second best, followed by the TP/DP option. For most of the dairies that preferred the DPSP, the TP/DP was the second choice. Interestingly, the TP/DP with smaller per unit payments generated more NCFI than the larger MILC payment. The key is that the TP/DP payment is made on all production, not just 2.4 million pounds.

One other general result is of interest. The preference on policy option holds across region. The smaller representative farms prefer MILC, no matter the region. It is the size of the dairy that matters, not where they are located.

Income Risk

Income risk is measured, in this paper, by the coefficient of variation (CV) of NCFI. The CV is defined as:

$$CV = \frac{\sigma}{\text{mean}}$$

Where σ is the standard deviation of net cash income and the mean is the average NCFI over the period

It is expressed in percent terms and indicates what the standard deviation of income is as a percent of the mean NCFI. A larger CV indicates more NCFI risk.

Many government policies have been predicated on their ability to mitigate, or reduce risk. Reducing risk has been cited as a goal of farm programs. Price supports clearly reduce risk, by truncating the distribution of possible prices; e.g. prices can't fall below the support level. Each of the analyzed policy options has some impact on income risk.

Figure 2 contains the CV for the California dairy (CAD 1700) for 2008 and 2013. In 2008, the DPSP has the smallest CV (37 percent) in NCFI of any of the options, followed by the TP/DP (47.5 percent) and the MILC (64.2 percent). The DPSP program is expected to generate the least risk given that it is a price support and in reality eliminates downside price risk below $9.90/cwt.

That rank order is maintained in 2013. However, there are some differences between options. Risk is less from 2008 to 2013 for the MILC option, but increases for the TP/DP and DPSP options.

Smaller dairies, for example, the 145 cow Wisconsin dairy, have the smallest risk with the DPSP option, followed by MILC and TP/DP (Figure 3). That order is the same in 2013, as well. Based on average NCFI this farm preferred the MILC program, but the DPSP generated
least risk.

Figure 4 contains a probability density function (pdf) of NCFI for the California dairy. A pdf is a way to illustrate the differences in risk. The DPSP has the highest mean NCFI. Of note, is the lower tail of each option. The DPSP tail is clearly shorter than the other two options.

Again using the 145 cow Wisconsin dairy as an example, there is little difference between the risks from each option (Figure 5). The DPSP provides little difference in risk reduction on ncfi from the other options. NCFI includes both costs and returns, as it is a little different from just price. A dairy must be able to cover all of its costs to remain in business. Shortfalls have to be refinanced, while better than expected returns can be used to pay down debt. The DPSP provides little more risk reduction than the other options for a small dairy.

Table 2 also contains a statistical comparison of the risk associated with each policy option. Each alternative is compared to the other to assess whether the difference in NCFI risk is statistically different. For the 250 cow Washington dairy (WAD250) the risk on NCFI is statistically the same between the DPSP and the TP/DP programs.

There appears to be no significant difference in NCFI risk between the options for the smallest dairies. The four smallest dairies, WID 145, NYCD110, VTD134, and MOD85, have no statistical difference in price risk between the policy options.

A significant result of this research is difference in risk reduction provided by each policy option by dairy size. Across the board, the large dairies experience much more income risk reduction from the DPSP than do the smaller dairies. It would suggest that the risk reduction function of policies is much more valuable to large dairies than to small dairies.

Summary

This paper examined 3 dairy policy options: Target price/ deficiency payment (TP/DP), continuation of MILC, and an increase in the price support (DPSP). The results indicate several major impacts of these policy options on the representative dairies.

The first is that the policy options have impacts that are structural in nature, not regional. For example, smaller dairies prefer the MILC continuation, regardless of location. MILC is the third choice of large dairies regardless of location.

Second, there is a timing issue. While most of the dairies prefer the DPSP (and the remaining 4 dairies rank it second) the DPSP benefits begin to fade by the end of the period. By 2013, some dairies receive more NCFI from policies other than the price support. The price support does reduce risk, but as stocks build, there is less opportunity for high returns due to the depressing effects that stocks have on price.

Third, the DPSP has a structural impact. The DPSP does reduce NCFI risk, but it is most keenly felt on the large dairies. The DPSP affects every cwt produced, so by supporting it, the large dairies benefit most, both in terms of overall NCFI, but also in risk reduction. In other words, the DPSP is much more valuable to large dairies than to small dairies. Small dairies then would prefer the income support properties of a targeted program like MILC. This result tends to be counter to the actual comments andanecdotal evidence from the dairy industry.

The dairy industry has always been wracked by regional and structural fights. The near future promises to be no exception. This study looked at how three policy options might affect dairy farms regionally and structurally. It would appear that structural issues may be more important than regional issues going forward.

References

Outlaw, J.L., D.P. Anderson, and J.W. Richardson. "Consequences of Moving to Less Trade Distorting U.S. Agricultural Policies: Lessons Learned and Potential for Dairy." AFPC Working Paper, Forthcoming, 2006.

Brown, D.S. "Milk Policy Options." Presentation at the 2006 National Dairy Economist Workshop. San Antonio, TX, March 23-24, 2006.

Table 2. Net Cash Farm Income and Coefficient of Variation on Net-Cash Farm Income For Representative Dairy Farms Under 3 Dairy Policy Alternatives.

Farm	MILC	TPDP	DPSP	Farm	MILC	TPDP	DPSP
CAD1710				**WID145**			
Avg. NCFI	905.46[C]*	965.7[B]	1,040.1[A]	Avg. NCFI	153.0[A]	147.3[B]	152.9[A]
CV (%)	27.3[B]	21.1[A]	18.7[A]	CV (%)	19.4[A]	19.8[A]	19.2[A]
2008 NCFI	799.0	860.8	1,040.5	2008 NCFI	143.7	136.5	151.0
CV (%)	64.2	47.5	37.0	CV (%)	46.1	47.8	44.7
2013 NCFI	996.3	1,062.2	1,064.9	2013 NCFI	170.0	165.8	165.0
CV (%)	61.8	49.3	39.8	CV (%)	47.4	48.0	45.9
NMD2125				**WID775**			
Avg. NCFI	1,155.0[C]	1,226.6[B]	1,310.8[A]	Avg. NCFI	955.5[B]	979.4[B]	1,009.4[A]
CV (%)	29.9[B]	24.6[A]	22.4[A]	CV (%)	18.6[A]	16.9[A]	16.6[A]
2008 NCFI	1,054.4	1,127. 7	1,332.0	2008 NCFI	882.3	907.1	985.0
CV (%)	67.7	54.8	46.7	CV (%)	44.4	40.6	38.7
2013 NCFI	1251.3	1,329.7	1,327.8	2013 NCFI	1,024.7	1,051.2	1,046.6
CV (%)	70.9	60.1	53.1	CV (%)	46.3	42.6	41.0
WAD250				**NYHWD800**			
Avg. NCFI	180.7[B]	178.9[B]	192.0[A]	Avg. NCFI	-40.3[C]	-10.8[B]	35.0[A]
CV (%)	27.9[B]	26.4[B]	23.8[A]	CV (%)	-377.0[B]	-1,190.0[A]	360.6[A]
2008 NCFI	151.1	147.8	176.8	2008 NCFI	-32.9	-9.1	77.1
CV (%)	68.4	65.8	55.8	CV (%)	-821.1	-2,500.4	289.0
2013 NCFI	208.6	208.9	210.4	2013 NCFI	-77.8	-38.7	-20.6
CV (%)	62.2	59.3	52.7	CV (%)	-424.8	-744.3	-1,214.1
WAD850				**NYWD1200**			
Avg. NCFI	17.7[C]	48.6[B]	102.9[A]	Avg. NCFI	-7.5[C]	38.2[B]	97.2[A]
CV (%)	118.3[B]	387.4	177.4[A]	CV (%)	-2,769.4[A]	458.0[A]	1,74.5[A]
2008 NCFI	-3.3	23.1	127.9	2008 NCFI	-11.4	30.6	157.6
CV (%)	-11,834.6	1,520.2	276.5	CV (%)	-3,543.7	1,089.0	207.3
2013 NCFI	25.5	64.9	83.3	2013 NCFI	-30.6	24.4	35.6
CV (%)	1,913.1	694.2	485.4	CV (%)	-1,602.9	1,746.8	1,030.7
IDD1000				**NYCD110**			
Avg. NCFI	300.4[C]	335.9[B]	376.0[A]	Avg. NCFI	168.6[C]	161.2[B]	166.1[A]
CV (%)	67.5[B]	54.3[A]	48.9[A]	CV (%)	9.2[A]	9.6[A]	8.9[A]
2008 NCFI	243.1	278.6	378.7	2008 NCFI	154.8	145.7	157.9
CV (%)	176.5	139.7	107.0	CV (%)	21.0	22.3	20.1
2013 NCFI	352.8	393.4	390.7	2013 NCFI	177.2	171.4	171.1
CV (%)	149.9	123.9	118.0	CV (%)	23.8	24.8	21.2
IDD3000				**NYCD500**			
Avg. NCFI	1,856.0[C]	1,987.0[B]	2,109.0[A]	Avg. NCFI	2253.9[C]	265.0[B]	287.9[A]
CV (%)	33.1[B]	27.8[A]	26.6[A]	CV (%)	31.8[B]	25.9[A]	23.1[A]
2008 NCFI	1,599.0	1,734.9	2,035.1	2008 NCFI	199.4	209.1	263.6
CV (%)	81.7	67.9	60.3	CV (%)	82.9	67.0	52.2
2013 NCFI	2,101.2	2,243.1	2,237.8	2013 NCFI	295.4	309.6	310.2
CV (%)	76.2	65.5	62.2	CV (%)	69.5	58.9	49.9
TXND2400				**VTD134**			
Avg. NCFI	806.9[C]	891.6[B]	986.5[A]	Avg. NCFI	131.9[A]	124.9[B]	130.9[A]
CV (%)	46.8[B]	36.6[A]	32.5[A]	CV (%)	15.5[A]	16.0[A]	14.9[A]
2008 NCFI	721.4	807.5	1,038.1	2008 NCFI	121.1	112.7	126.7
CV (%)	108.5	82.3	63.8	CV (%)	33.1	34.7	30.5
2013 NCFI	882.5	975.5	972.0	2013 NCFI	141.6	135.8	136.1
CV (%)	109.3	87.9	76.7	CV (%)	36.6	37.8	32.8

Table 2. Continued.

Farm	MILC	TPDP	DPSP	Farm	MILC	TPDP	DPSP
TXCD550				**VTD350**			
Avg. NCFI	-167.5 B	-159.8 B	-135.3 A	Avg. NCFI	44.1 B	46.9 B	63.8 A
CV (%)	-54.4 B	-52.2 A	-62.3 A	CV (%)	132.8 B	111.3 A	79.2 A
2008 NCFI	-130.0	-124.5	-78.5	2008 NCFI	34.7	35.8	71.3
CV (%)	-120.5	-112.5	-179.8	CV (%)	313.7	268.6	133.1
2013 NCFI	-215.3	-203.7	-194.5	2013 NCFI	43.2	48.5	52.5
CV (%)	-91.3	-88.9	-83.3	CV (%)	319.0	259.5	206.6
TXCD1300				**MOD85**			
Avg. NCFI	620.0 C	657.1 B	706.1 A	Avg. NCFI	61.8 C	55.1 B	58.0 A
CV (%)	31.6 B	26.1 A	23.9 A	CV (%)	24.3 A	28.0 A	26.9 A
2008 NCFI	549.4	586.4	704.4	2008 NCFI	57.3	50.6	57.1
CV (%)	73.8	59.9	49.9	CV (%)	49.9	57.3	52.2
2013 NCFI	682.1	724.1	723.2	2013 NCFI	66.1	59.3	59.6
CV (%)	73.3	62.1	54.4	CV (%)	53.2	60.9	57.3
TXED550				**MOD400**			
Avg. NCFI	128.0 B	133.4 B	151.4 A	Avg. NCFI	297.8 B	301.4 B	315.6 A
CV (%)	63.3 B	55.8 A	48.6 A	CV (%)	25.5 A	23.7 A	22.8 A
2008 NCFI	105.7	109.5	151.8	2008 NCFI	267.7	270.3	306.7
CV (%)	157.4	140.6	103.8	CV (%)	60.7	56.7	51.6
2013 NCFI	147.1	155.5	155.7	2013 NCFI	328.4	334.2	331.9
CV (%)	140.6	62.1	113.8	CV (%)	60.4	56.3	53.3
TXED1000				**FLND550**			
Avg. NCFI	535.4 C	561.8 B	600.3 A	Avg. NCFI	730.6 B	736.7 AB	748.4 A
CV (%)	33.5 B	29.2 A	27.1 A	CV (%)	13.5 A	12.7 A	12.8 A
2008 NCFI	479.6	523.6	626.8	2008 NCFI	656.1	661.7	698.6
CV (%)	76.9	66.9	58.2	CV (%)	29.6	27.7	27.1
2013 NCFI	573.8	604.1	602.0	2013 NCFI	792.2	800.3	793.9
CV (%)	81.4	71.9	66.2	CV (%)	29.4	27.6	26.8
FLSD1500							
Avg. NCFI	-567.3 C	-521.6 B	-478.2 A				
CV (%)	-46.1 B	-45.0 A	-51.0 AB				
2008 NCFI	-525.1	-485.7	-386.6				
CV (%)	-85.3	-82.6	-107.9				
2013 NCFI	-665.0	-607.1	-604.5				
CV (%)	-84.7	-84.7	-81.0				

* Same letter designates options that are not significantly different from each other at the 5 percent level.

Figure 2. Coefficient of Variation of NCFI for CAD1710 in 2008 & 2013.

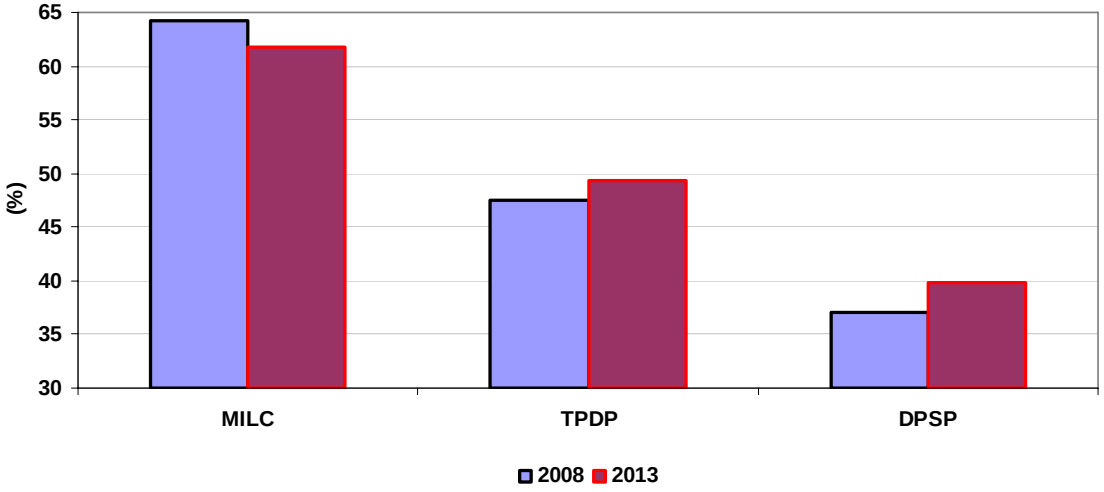

Figure 3. Coefficient of Variation of NCFI for WID145 in 2008 & 2013.

Figure 4. Probability Density Function of Net Cash Farm Income Approximations for 1,710 Cow Representative California Dairy.

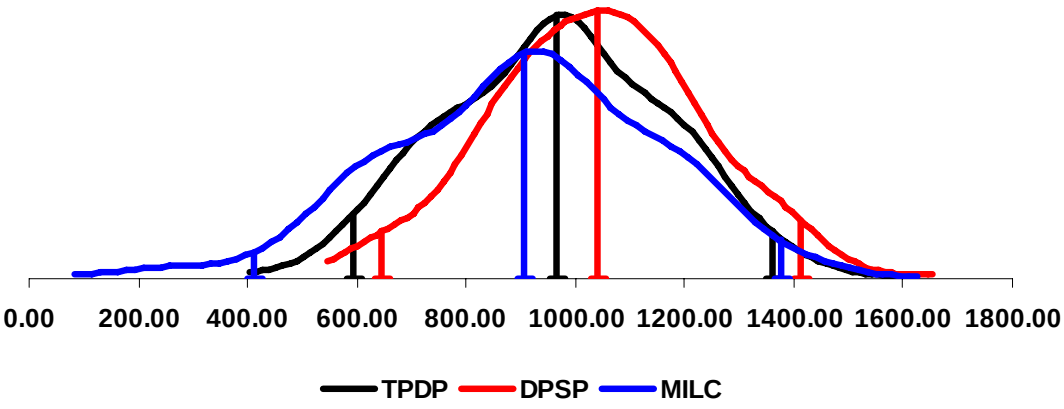

Figure 5. Probability Density Function of Net Cash Farm Income Approximations for 145 Cow Representative Wisconsin Dairy.