Getting Serious About the Structural Surplus of Skim Milk Powder: The Next Challenge Facing the Canadian Dairy Industry

SPECIAL REPORT

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Introduction

At its late April board meeting, the Dairy Farmers of Ontario (DFO) decided on significant changes to milk pricing in Ontario. Under the changes to be fully implemented by August 1, 2005, a payment cap would be placed on the level of a producer's solids-not-fat (SNF) milk test relative to the butterfat test. Producers with a ratio of SNF:Butterfat in excess of 2.35 will not be paid for the "surplus" SNF in excess of the 2.35 ratio. This decision is consistent with individual province targets for SNF:Butterfat ratios agreed to by the Canadian Milk Supply Management Committee (CMSMC).

The reason for the CMSMC ratios, and the Ontario pricing decision, is that supplies of skim milk powder and milk proteins have increased dramatically and are pressuring the supply management system. The *structural surplus* of skim milk powder results from the yield of skim relative to butterfat in manufactured dairy products. Supply management agencies establish quota production levels in an attempt to balance supply with domestic demand for manufactured products at prescribed prices; however, in doing so, yields of non-fat solids are created (notably skim milk powder (SMP)) that exceed Canadian demand. In the past, this surplus has been disposed of as exports or as international food aid. The WTO dairy export decision of 2002 sharply limited the extent to which SMP can be exported, and burgeoning supplies of SMP and its substitutes are now a serious concern.

At the same time, because the production quota system is regulated on the basis of butterfat, as quota prices have increased producers have been under increased pressure to make optimal use of quota. Some producers have found that by intentionally lowering butterfat tests, they can sell a greater volume of milk and remain within quota limits. The effect is to generate higher return relative to quota investment. It also has the effect of increasing the supply of SNF and contributing to the structural surplus. Clearly, the DFO decision is intended to stop farmers from leveraging quota investments in this way.

The purpose of this special report is to describe the structural surplus issue in Canada, to analyze some potential consequences, and to suggest potential alternatives in light of the pricing decision made by Dairy Farmers of Ontario.

The Structural Surplus Problem

Non-fat milk solids, or SNF (comprised of protein and other solids) are important aspects of several manufactured dairy products. In particular, cheese yields tend to be highly dependent on milk protein content. Other non-fat solids contribute to dairy manufacturing byproducts; for example, whey is a byproduct of cheese manufacturing, and skim milk powder is a joint product in butter production. For the most part, these products have a relatively low value, and the domestic demand for them in Canada is saturated or at least mature.

However, Canadian skim milk powder production appears to be on the increase. Table 1 presents national SMP production, imports, and ending inventories since 2000. The table shows that SMP production increased by over 16% between 2000 and 2004. Imports of SMP increased by 55%, although anecdotal cross-referencing of the above data against AAFC data suggests that most of the imports were probably re-exported under the Import for Re-Export Program (IREP). Ending inventories of SMP, quoted on a December basis, were up 144%.

Table 1 Canadian Skim Milk Powder Production, Imports, and Ending Inventories, Tonnes

	Production	Imports	Ending Stocks*
2000	75,386	1,738	16,994
2001	90,288	2,664	19,129
2002	82,019	1,338	8,047
2003	90,753	2,385	22,597
2004	87,816	2,700	41,456
Change 2000-2004	16.5%	55.4%	143.9%

*Month of December
Source: Statistics Canada

In addition, the imports of certain alternative milk proteins are up sharply. Table 2 below presents Canadian imports of milk protein concentrates in 2002, 2003, and 2004. The table shows that imports of condensed whey, other modified whey, other whey, and caseinates/casein derivatives have grown significantly since 2002. To the extent that these products can serve as substitutes for domestic SMP, the imports exacerbate the structural surplus. Anecdotally, these products, especially casein and casein derivatives, are not re-exported to nearly the same extent as SMP[1].

Table 2 Canadian Imports of Milk Protein Concentrates, kg

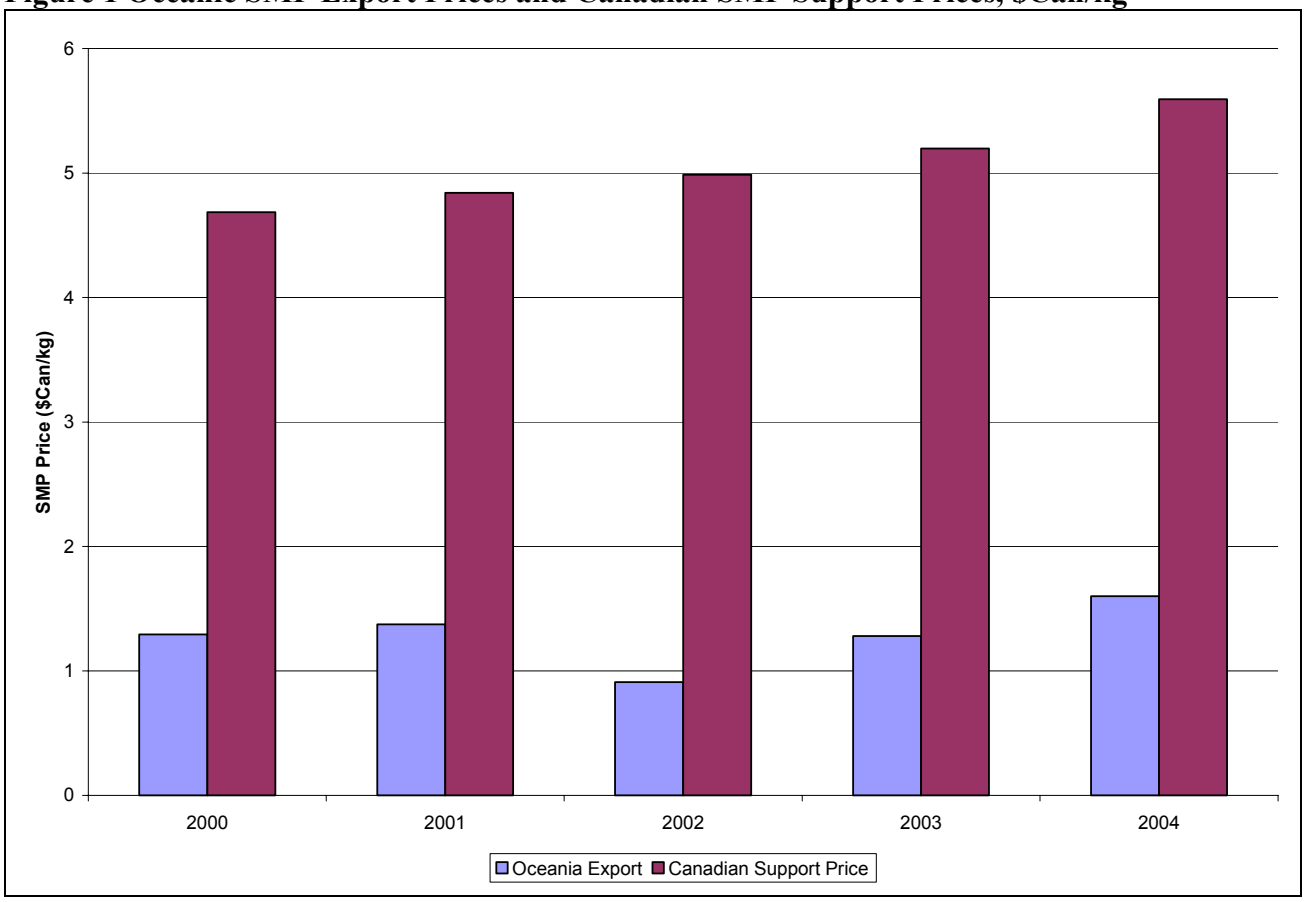
	2002	2003	2004
Whey Protein Concentrate	11,964,003	12,012,155	7,127,329
Condensed Whey	5,156,278	2,414,691	14,571,304
Other Modified Whey	11,705,202	13,621,096	18,423,891
Other Whey	8,735,235	13,844,729	10,649,372
Casein Used in Non-food Manufacturing	436,028	394,551	417,009
Other Casein	4,573,457	6,911,486	4,995,260
Caseinates and Casein Derivatives	4,480,550	6,815,296	7,774,615
Milk Albumin	3,897,962	6,057,056	3,047,354

Source: Agriculture and Agri-food Canada, Dairy Section

[1] IREP volumes are not tracked for the above milk protein concentrates, because TRQ's are not in place for them.

Indeed, the increase in milk protein concentrate imports is not surprising, given the Canadian support price for SMP relative to the world price. Figure 1 plots export prices of SMP in Oceania converted to Canadian dollars, relative to Canadian support prices for SMP. The figure shows that the Oceania price (effectively the world price) is sharply lower than the Canadian support price. It also shows that while Oceania prices have varied, Canadian support prices have been rising on a consistent basis. No relationship between the two is evident, and as the spread widens, the incentive for processors to import only increases.

Figure 1 Oceanic SMP Export Prices and Canadian SMP Support Prices, $Can/kg



Sources: USDA Agricultural Marketing Service and Canadian Dairy Commission. Oceanic prices are the top of the range reported by USDA

At the same time, because of the 2002 WTO dairy export decision, Canada is limited to its levels of subsidized exports for SMP negotiated in the 1994 Uruguay Round. This cap on annual subsidized exports of SMP was 44,953 tonnes or $31.15 million in 2000/01, where it remains frozen pending completion of the WTO Doha Round (where discussions indicate that export subsidies are apt to be eliminated). Interestingly, as shown in Table 3, Canada has not hit the SMP export cap on a volume basis since the 2002 dairy export decision. Canada has yet to report the deemed export subsidies on SMP exports; however, the fact that exports are well under the volume cap, combined with the large difference between domestic support and world prices that forms the basis for the export subsidy measure, would suggest that the cap on export subsidies is probably constraining

exports. Because the domestic SMP support price is high relative to world prices, less SMP can be removed within the fixed cap export subsidy cap[2].

Table 3 Canadian Exports of Skim Milk Powder, Tonnes

	Exports (tonnes)
2000	32,452
2001	45,753
2002	48,518
2003	35,218
2004	16,990
SMP Subsidized Export Cap (tonnes)	44,953
SMP Subsidized Export Cap ($)	31,149,000

Source: Statistics Canada and the Canadian Border Services Agency

Thus, the situation regarding the status of the structural surplus of SMP can be summarized as follows:

- SMP production is up, which exacerbates the structural surplus problem
- SMP imports are up, although it appears as though most of this has been re-exported under IREP
- Imports of milk proteins that can substitute for SMP are up, which exacerbates the structural surplus problem
- SMP inventories are building, which exacerbates the structural surplus problem
- SMP exports have been decreasing (and have prospects to cease entirely in the future) which exacerbates the structural surplus problem.

This situation has drawn the attention of the Canadian Dairy Commission and provincial milk marketing boards, for good reason. A support price scheme is in place for skim milk powder and butter. For milk marketed in the butter and SMP class 4(a), surplus SMP purchases are made by the Canadian Dairy Commission at the support price (which, as noted above, is well above the world SMP price). Alternatively, milk used to make SMP is reclassified into lower-priced SMP surplus removal class 4(m), or exported under class 5(d). The costs of disposal of surplus SMP through reclassification in these lower priced classes, which occurs at much lower prices than support, must ultimately be covered out of the broader milk revenue pool. In other words, the costs of surplus SMP that is exported at a loss, further processed into a product for the domestic market (such as the milk protein concentrates listed in Table 2 above), or manufactured into livestock feeds, must be taken from milk pool revenue.

Some indication of this is presented in Table 4 below. The table presents Canadian milk volumes marketed in Class 4(a) (milk for butter and SMP manufacturing) and Class 4(m) (milk for marginal use). The price paid for butterfat and protein components is also

[2] It is important to note that the export subsidies referred to here are *deemed*, following the 2002 WTO Export Decision. Canada does not use government sponsored export subsidies in SMP or dairy products generally. The deemed export subsidy is the domestic support price less the world price, multiplied by the volume of export.

presented for each class[3]. The table shows that, nationally, the volume of milk marketed in Class 4(a) has decreased significantly in recent years. At the same time, the volume marketed in Class 4(m) is up sharply. The implication is that progressively less SMP is actually moving at the support price, and significantly more is being sold in surplus (read- *low valued*) uses. The component values show the significance of the effective loss in pool revenue that has occurred. For the last dairy year (2003-04) the butterfat price in class 4(m) was $.51/kg compared with $6.53/kg in class 4(a), and the protein value in class 4(m) was also $.51/kg compared with $4.41/kg in class 4(a). Thus, the prices in class 4(m) are dramatically lower than in class 4(a), and increasing volumes are being moved from class 4(a) into 4(m) and other low-valued price classes. This constitutes a loss in producer pool revenue from any perspective.

Table 4 Canadian Volumes and Average Component Values, Classes 4(a) and 4(m)

	Canadian Shipments in Class 4(a)			Canadian Shipments in Class 4(m)		
	Volume (HL)	$/kg Butterfat	$/kg Protein*	Volume (HL)	$/kg Butterfat	$/kg Protein*
2000	2,867,172	5.69	3.85	64,929	N/A	N/A
2001	2,249,662	5.84	3.99	1,105,394	1.69	1.84
2002	2,419,053	6.06	4.12	1,048,056	1.51	1.63
2003	2,472,100	6.29	4.29	1,321,874	1.21	1.28
2004	2,052,895	6.53	4.41	3,985,997	.51	.51

* Dairy year basis; 1999-2000, 2000-2001, 2001-2002, 2002-2003, 2003-2004
N/A- Not Available
Source: Canadian Dairy Information Centre

Multiple Component Pricing

Among the factors influencing the structural surplus of SMP is the composition of the milk supply according to its constituent components - butterfat, protein, and other solids. Under multiple component pricing, farmers are paid according to their milk test for each of these components at the price allotted for each component. Producers with higher milk tests receive a higher price, which directs incentives in breeding and nutrition.

Table 5 presents component prices in the milk classes that represented about 79% of Ontario milk utilization in 2003-2004. The table shows that, since 2001, the price of all components, including protein and other solids, has increased between 17% and 21% (depending on the specific milk class). Given the strain placed on the system from the growing structural surplus, it seems odd that for the milk components that contribute to it, (i.e. protein and other solids) the price has been increasing. To help control the structural surplus, one would have expected protein and other solids prices to fall.

[3] In many cases (such as Ontario) protein and other solids component values are the same within a price class. However, since some other prices have different prices for protein and other solids in a class, a single national average SNF price cannot be quoted for milk in Class 4(a) and 4(m). In practice, protein and other solids prices for these classes are very similar, so the protein price is indicative of SNF value.

Table 5 Component Prices, Leading Ontario Milk Utilization Classes

	Class 1 (a) and 1 (c)			Class 3 (a)			Class 3 (b)		
	Butterfat	Protein	Other Solids	Butterfat	Protein	Other Solids	Butterfat	Protein	Other Solids
2001	5.9797	4.8618	4.8618	5.9797	10.5899	0.6638	5.9797	10.131	0.6638
2002	6.1919	4.9265	4.9265	6.1919	10.8984	0.6833	6.1919	10.44	0.6833
2003	6.4405	5.1592	5.1592	6.4405	11.302	0.709	6.4405	10.843	0.709
2004	6.6717	5.3748	5.3748	6.6717	11.6779	0.733	6.6717	11.219	0.733
2005	7.3661	5.6849	5.6849	7.3661	12.3737	0.777	7.3661	11.915	0.777
	Class 4 (a) and (d)			**Class 4 (b)**			**Class 4 (c)**		
	Butterfat	Protein	Other Solids	Butterfat	Protein	Other Solids	Butterfat	Protein	Other Solids
2001	5.9797	4.0601	4.0601	5.9797	4.1698	4.1698	5.9797	4.0601	4.0601
2002	6.1919	4.1843	4.1843	6.1919	4.294	4.294	6.1919	4.1843	4.1843
2003	6.4405	4.3478	4.3478	6.4405	4.4575	4.4575	6.4405	4.3478	4.3478
2004	6.6717	4.5001	4.5001	6.6717	4.6098	4.6098	6.6717	4.5001	4.5001
2005	7.3661	4.7804	4.7804	7.3661	4.8901	4.8901	7.3661	4.9162	4.9162

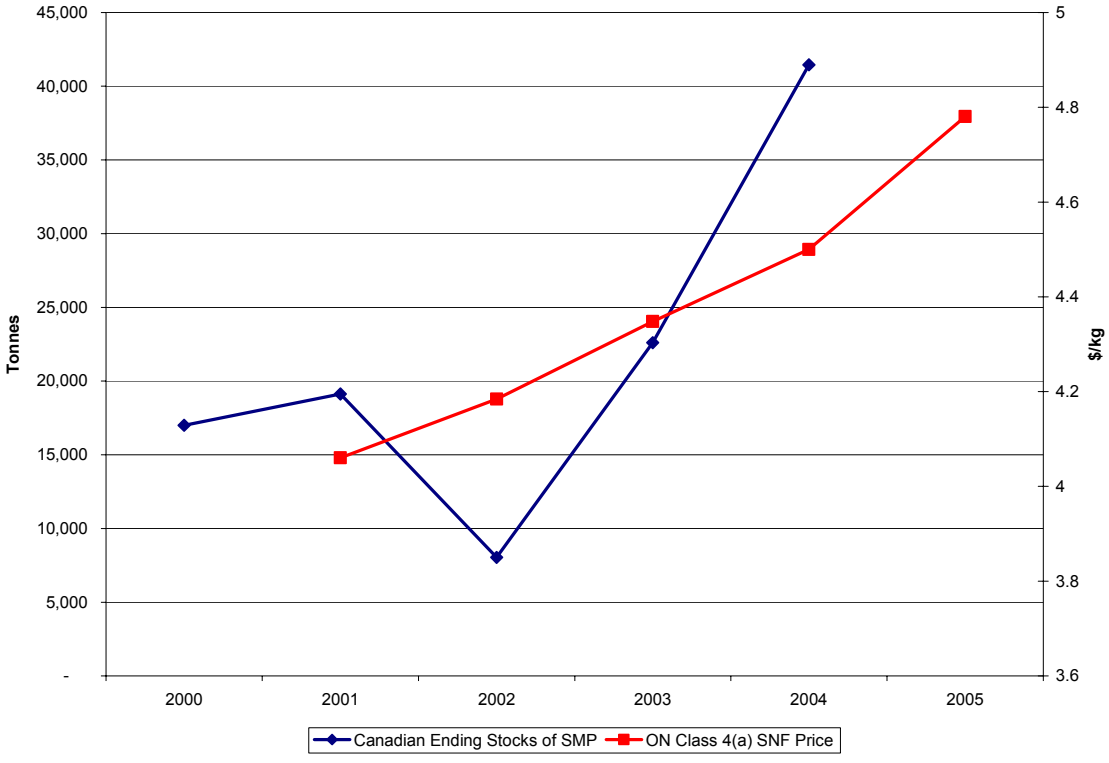
Source: Dairy Farmers of Ontario, Dairy Statistical Handbook 2003-2004

Class Definitions:
Class 1- Fluid Milks
Class 3(a)- Specialty Cheeses
Class 3(b)- Cheddar cheese and cream cheeses
Class 4(a)- Butter and milk powder
Class 4(b)- condensed milk for retail
Class 4(c)- new products
Class 4(d)- inventories and plant losses

Figure 2 puts the above into context. It shows the growth in SMP inventories over time, along with the component prices used for SNF (both protein and other solids) for Ontario Class 4(a), which is the price class for milk used to make butter and skim milk powder. The figure shows an apparent positive relationship between the price paid for SNF components (which drives production of SMP) and inventories of SMP. In other words, as SMP inventories have increased, the price paid for the milk components most responsible for SMP production have also increased. On one hand, this is surprising, because the price of something we have too much of has been consistently raised. The result is an incentive to supply more of it, or at least not curtail supplying it. As is observed below, producers have amply demonstrated that they will respond to incentives. On the other, if the price of industrial milk is to be raised, under the supply managed system raising the support prices for butter and SMP is essentially the only way to do it. This naturally lends itself to increasing component prices in the butter/SMP milk class.

It should also be noted that, at beginning of the 2004/05 dairy year, the Dairy Farmers of Ontario reduced the price of protein and increased the price of butterfat paid to farmers; this is not reflected in Table 4 or in Figure 2. The intent was to give producers the incentive to reduce milk protein production. However, the component prices charged to processors did not change in reflection of this. This leaves the incentive for processors to import SMP and substitute milk proteins relatively unchanged.

Figure 2 Canadian SMP Inventories and Ontario Class 4(a) SNF Prices



Source: Statistics Canada and Dairy Farmers of Ontario

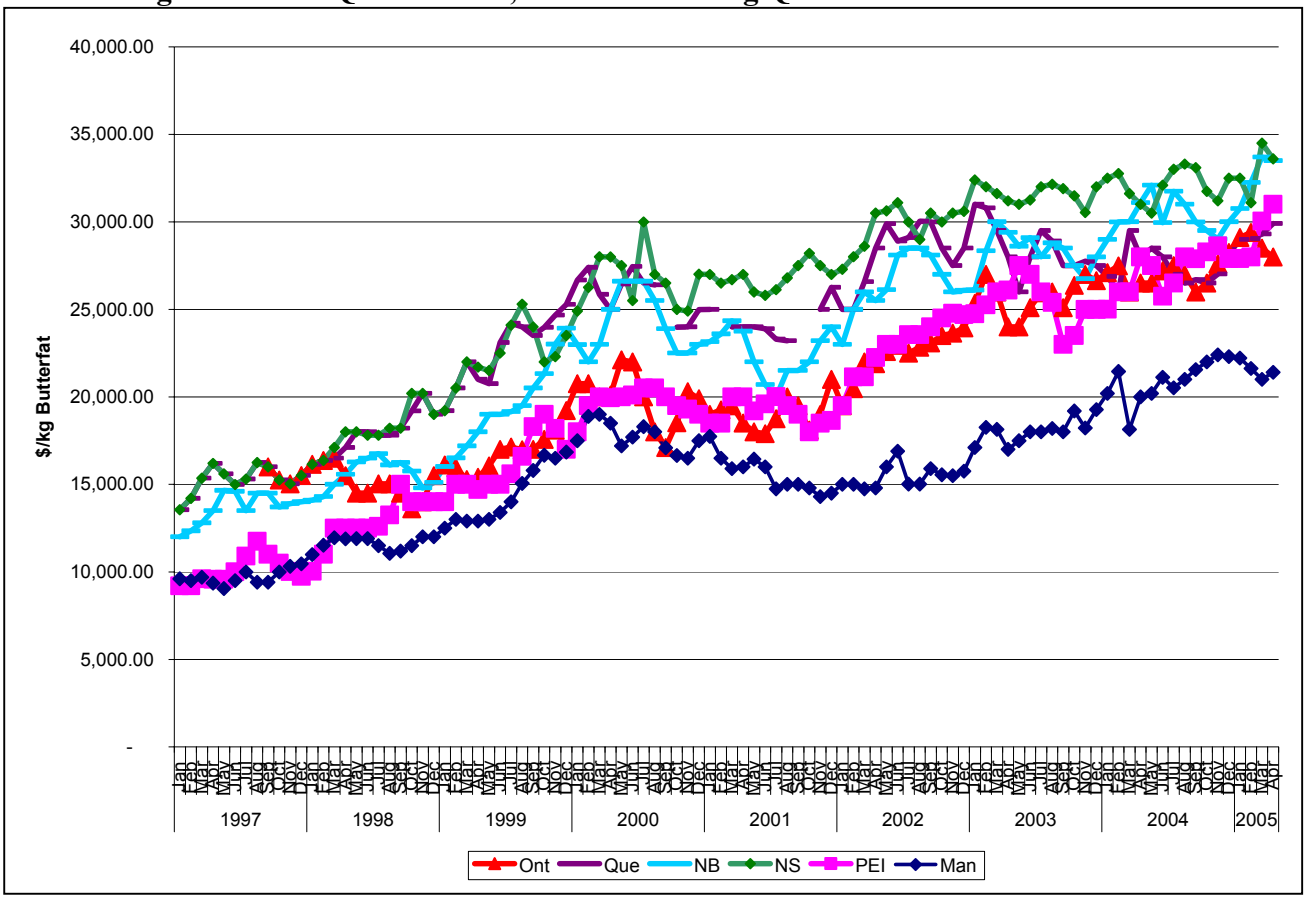
Quota Values

Throughout the growth in the structural surplus, milk quota values have increased aggressively. Figure 3 presents quota values for provinces that base quota on butterfat. The figure shows that quota values have doubled or nearly doubled in most regions since 1997. Quota values in eastern Canada are approaching or in excess of $30,000/kg.

Financing quota at these price levels is a struggle for many producers. As a result, some have innovated through nutrition and genetics to decrease the butterfat test and sell more milk against their quota, and elevate protein and other solids tests relative to butterfat. This is a recent technological development- it had previously been observed that butterfat and protein tests were quite closely tied, and little could be done to decouple them. The effect of this manipulation on the level of quota investment required, and therefore the return against quota investment, can be dramatic.

Consider the following simplified example in Table 6 below, in which we initially assume a herd with a rolling herd average of 10,000 kg milk produced per cow per year, a butterfat test of 3.9%, protein test of 3.3%, and other solids test of 5.76%. At this level of milk production and test, 390 kg of butterfat are produced, requiring quota of approximately 1.07 kg/cow. This represents the 12-month average Ontario milk test for 2003/04. This is contrasted with a scenario in which the butterfat test is intentionally decreased by management to 3.6%, the protein test is elevated to 3.6%, and the other solids test is 5.5%. At this test, the ratio of SNF:Butterfat is 2.53- which would be out of compliance in Ontario. Under this altered milk test, less than 1 kg of quota is required per cow. The ultimate impact resulting from altering the milk test is that revenue per cow decreases; however, because less quota is required, the revenue per kg of quota increases. Since the investment in quota is much larger than the investment in cows (particularly for new or expanding operations) the ultimate return to capital employed is likely to be higher under the manipulated milk test than under the base milk test. Conversely, more cows can be milked for a given level of quota under the manipulated milk test, relative to the base. Thus, the incentive to manipulate milk tests is straightforward.

Figure 3 Milk Quota Prices, Provinces Basing Quota on Butterfat



Source: Dairy Farmers of Ontario

Table 6 Impact of Milk Test on Return per cow and Return to Quota

		Base Milk Test	Altered Milk Test
Butterfat	Test	3.9%	3.6%
	Price	$7.36/kg	$7.36/kg
Protein*	Test	3.3%	3.6%
	Price	$6.50/kg	$6.50/kg
Other Solids*	Test	5.76%	5.5%
	Price	$3.23/kg	$3.23/kg
Rolling herd average (kg.cow/year)		10,000	10,000
Butterfat production/year (kg)		390	360
Quota/cow (kg BF)*		1.068	0.986
Revenue/cow/year		$6875.88	$6766.10
Revenue/kg quota/year		$6435.12	$6860.07

*The prices of protein and other solids components vary according to milk class; values are estimates across classes based on 2003/04 utilization.

** Quota calculated on the basis of daily butterfat production (annual production/365 days)

Analysis of Apparent Alternatives

Based on the above, an incentive exists for producers to leverage quota investment by supplying relatively more SNF and relatively less butterfat in the milk they produce. This exacerbates the structural surplus issue. Given the foregoing, there are several approaches that might address this issue:

- Impose a payment cap on SNF milk components, based on a ratio to SNF:butterfat
- Alter the structure of component pricing to reduce the value of SNF
- Alter the structure of the quota to limit the total volume of production or other criteria, rather than just butterfat
- Impose maximum discipline on imports of non-fat solids
- Broaden consideration of support price structures

The first option is that instituted by the Dairy Farmers of Ontario. Under this measure, no payment will be received for SNF components above an SNF:Butterfat ratio of 2.35. Its effect is clearly to target producers attempting to leverage quota investment by suppressing butterfat tests, as illustrated above (indeed, the altered milk test illustrated in Table 4 above would not receive full payment under the Ontario rule). Thus, the rule will single out these producers (potentially at significant financial cost), and give no incentives for producers under the 2.35 ratio to reduce SNF production. It will also appear to some producers that their marketing board is dictating what their milk test *should be*, which is a role not previously filled by marketing boards.

The second option is to alter the structure of component prices to reflect the seriousness of the structural surplus situation. With it, the prices of protein and other solids would be decreased, and the value of butterfat increased on a revenue-neutral basis. As noted above, this has been initiated as of the beginning of the 2004/05 dairy year in Ontario; however, given the apparent severity of the situation, more drastic reallocation of revenue away from SNF and toward butterfat could be considered. By doing so, the incentive would be created for all producers to reduce SNF production (not just those that have manipulated milk tests as illustrated above). This measure would still cause strain for producers altering milk tests for low butterfat, but the pain of adjustment would at least be shared. It would, presumably, be more successful in reducing SNF and the SMP surplus than what is essentially a penalty scheme advocated by the Dairy Farmers of Ontario.

In considering the structural surplus issue, a broader consideration of the factors motivating the manipulation of milk tests is warranted. What is clear from the scenarios above is that the suppression of butterfat tests is motivated by the fact that quota is based on butterfat and is very expensive. If the quota were based on another factor, say total milk production or SNF, then the incentive to manipulate milk tests in a way that exacerbated the structural surplus would decrease or disappear. No doubt supply management planning on a basis other than butterfat would be a significant and complex undertaking; however, the seriousness of the structural surplus issue warrants at least considering it.

Imports of milk protein concentrates, as noted above, are a source of ongoing difficulty in managing the structural surplus. Producers and their marketing boards argue that imports of both butterfat and non-fat solids (as blends or in intermediate product forms) are occurring outside of tariffs that should be applied. In several cases, tariff-rate quotas (TRQ's) have not been established for these products. If the will exists on behalf of government to retain milk supply management, then the import controls required for its operation must be consistently applied; marketing boards are right to continue pressure on this issue. However, in order to retain current market structures without attracting imports, focused work must occur in developing value-added products from non-fat milk solids. Ideally, such products would compete positively with imports, and allow Canada to retain existing levels of support prices for SMP. This is a tall order, indeed.

Finally, supply management agencies face a dilemma in reallocating revenue from SNF to butterfat given the current support price structure. For example, while Ontario has started to reallocate component value away from SNF and toward butterfat, it has not shifted this value in its sales to processors, which would reduce the incentive to import milk proteins. However, supply management agencies are constrained in doing this because of the support price for SMP. It is likely that if the same reallocation of component value away from SNF to butterfat paid to producers were applied to processors, the effect would be to undercut the SMP support price, which would then reduce pool revenue. Alternatives that might avoid this will be difficult to design, but warrant consideration. These might include adopting a support price for cheese to help maintain the milk support price, or perhaps a broadly defined support price for milk itself, with a flexible allocation of milk purchased at a support-price across manufacturing uses. Alternatively, if the system could be operated without a support price for SMP, and with SMP and SNF priced at world price levels, SMP exports could resume unimpeded by subsidized export caps, and without expensive diversions from class 4(m) that occur in the domestic market described above[4]. Another means to backstop pool revenue, perhaps through other support prices, would be required under this scheme.

Conclusion

The seriousness of the structural surplus issue needs to be addressed. It threatens to drown the supply management system in mounds of SMP which will continue to cost producer revenue to dispose of, and the prospects for disposing of it through existing channels appear to be dimming. Milk marketing agencies at all levels are keenly aware of this issue, and it is imperative that significant latitude is granted to them in resolving it. When the price paid for the milk components that result in the structural surplus has been rising, even as the surplus has grown, it is evident that the pricing system has not been in sync with the situation. And when the best solution forwarded is to penalize producers that have responded quite rationally to the incentives placed in front of them by capping payment based on the SNF:Butterfat ratio, more creative thinking is needed.

[4] This idea is not due to the author; it was first observed it in a presentation made by Mr. Peter Gould in a presentation at the Ontario Large Herd Operators' banquet in September, 2004.

This is more than a question of the carrot vs. the stick. By altering milk tests to leverage milk quota investment, producers have demonstrated that they can and will respond to incentives and innovate. So as a first step, incentives to reduce SNF production through further changes in the structure of the multiple component pricing system should be considered. Using this alternative, the butterfat price would increase and the prices of protein and other solids would decrease. This will give *all* producers the incentive to reduce their SNF test and increase their butterfat test, not just those that have altered milk tests to reduce butterfat and increase milk production. In addition to being a more equitable approach, it may be more likely to alleviate the problem: the current choice will primarily affect a small portion of producers and give no incentive to the majority for change. Ontario started down this road in the current dairy year, and conditions dictate that it should be further pursued.

If successful, changing the price ratios should have the added advantage of making it easier to maintain the support price of SMP, as the volume that would need to be purchased, as price support would decrease. This would reduce the drain placed on the broader milk revenue pool to finance SMP sales and surplus disposal, and should also reduce the incentive to import SMP.

Ultimately, broad changes in the system should be considered that address the motivations to suppress butterfat and elevate SNF levels in the first place, rather than focusing solely on the symptoms. This requires a much broader consideration than simply milk test levels. It is likely to include the basis for quota (butterfat vs. other criteria), enforcement of import controls, the potential for import replacement, and realignment of the support price system. These present daunting and disruptive challenges to the system, but getting serious about the current state of affairs warrants their consideration.