

Questions regarding current milk pricing structures in the dairy industry in South Africa

C.J.C. Muller[#] and N.R. Robertson¹

Institute for Animal Production, Private bag X1, Elsenburg 7607, South Africa

[#]E-mail: carelm@elsenburg.com

¹ARC, Animal Nutrition and Products Institute, PO Box 65, Elsenburg 7607, South Africa

Introduction

The milk pricing system in South Africa was controlled by the Dairy Board and was dualistic with a higher price being paid for fresh milk than for industrial milk. In 1983 the slogan "Milk is Milk" was adopted in an effort to pay all farmers a uniform price for their milk. Currently, milk prices are determined by the milk processors themselves, resulting in various milk pricing structures. Fresh milk is bought per litre of milk and it must have minimum fat and protein percentages. Milk for processing is bought according to the amount of fat and protein produced. Price for fat and protein usually varies with a higher emphasis on protein. An additional premium may be paid for protein to stimulate its production. Some milk processors also provide fresh milk to the market. Notwithstanding all the efforts to change, there are still real price disparities between fresh and industrial milk. Farmers tend to compare milk prices directly which is probably not correct, as milk prices will always differ because of the fat and protein percentages in milk, the amount of milk produced and the end product or processor.

Fat and protein yield

Most dairy processors have found that the fat and protein percentage of the milk they take in, is lower than what it was 10 to 15 years ago. The reduction in fat and protein percentages presents a problem for dairy processors as this increases the production cost of most milk products. Various factors may have contributed to this, but it is probably because of the antagonistic relationship between milk volume and fat and protein percentages. The increase in production costs for milk products is related to the higher transport and handling costs of milk with lower fat and protein percentages as more litres of milk are required to produce specific amounts of the same product. Fat and protein yields are determined by both the volume of milk produced and the percentage of fat and protein in the milk (Table 1).

Table 1 The effect of volume of milk produced and fat or protein percentage on fat or protein yield

Fat / Protein%	Milk yield (L/cow/day)						
	12.1	14.6	17.7	21.4	25.9	31.4	38.0
	Fat/protein yield (kg/cow/day)						
3.0	0.36	0.44	0.53	0.64	<u>0.77</u>	0.94	1.14
3.6	0.44	0.53	0.64	<u>0.77</u>	0.93	1.13	<u>1.37</u>
4.4	0.53	0.64	<u>0.77</u>	0.94	1.13	<u>1.37</u>	1.67
5.3	0.64	<u>0.77</u>	0.94	1.13	<u>1.37</u>	1.66	2.01
6.4	<u>0.77</u>	0.93	1.13	<u>1.37</u>	1.66	2.01	2.43

It is clear that higher fat or protein yields are obtained by increasing the volume of milk produced and/or the fat and protein percentage in the milk. Milk pricing structures based on fat and protein yields cause contrasting interests for producers and processors. Because the same price is being paid per kg fat or protein irrespective of the component percentage, dairy farmers tend to increase milk volume for a higher income. This is done by milking more cows or increasing the average milk yield in the herd. Dairy processors on the other hand need milk of a higher fat and protein percentage in an effort to keep the production cost of dairy products down. The problem in processing plants is that less cheese is made per

batch from milk with a lower than a higher solids content. This increases the cost of cheese production. The predicted Cheddar cheese production from 100 kg of milk increases from 9.5 to 13.7 kg when the fat and protein percentages of milk increase from 3.50 and 3.00% to 5.50 and 4.20%, respectively. Because of the higher fat percentage some 0.35 kg extra fat is also produced for butter. Prices for milk to be processed should encourage farmers to supply sufficient volumes of milk while maintaining or increasing fat and protein percentages. Dairy farmers will only do this if there is a financial incentive to provide the quality of milk that processors require.

Penalizing volume

Some countries have a milk pricing system based on prices paid per kg fat and protein with a penalty (a negative value) on the volume of milk produced. This is done presumably in an effort to encourage the production of milk of a higher milk solids content. It is, however, doubtful whether this practice will produce the desired results. In Table 2 the effect of a penalty on milk volume in a dairy herd is shown.

Table 2 The effect of a negative price on the volume of milk produced on the lactation income of cows in a Holstein herd

Parameters	Price	Production year		Change (%)
		1983/84	1997/98	
Milk (kg)	-5 c/litre	5112	8360	+64
Fat (kg)	R 5/kg	189	293	+55
Prot (kg)	R 12/kg	172	269	+56
Income (R)		2753	4275	+55

Milk yield in this herd increased by 64% from 1983/84 to 1997/98 while fat and protein yields also increased, although at a smaller margin. Fat and protein percentages of the milk were reduced at the same time, i.e. from 3.70 to 3.50% for fat and 3.36 to 3.22% for protein. The ratio of fat to protein yield did not change and was 1:0.91 in 1983/84 and 1:0.92 in 1997/98. The problem for the industry is that the income per lactation of cows in this herd increased even though milk with lower fat and protein percentages was produced. While the income from the herd increased, dairy processors received milk of a lower quality from which to produce their milk products. A penalty of 5 c/litre on the volume of milk did reduce income although the negative effect on the income per lactation was small compared to the improvement in milk yield. A penalty on volume of more than 24 c/litre would result in a similar income as in the 1983/84 production year. Although penalizing volume resulted in reducing farm income, a higher income is produced from milk containing less solids. The smaller farm income in relation to the improvement in milk yield is not big enough to stimulate the production of milk with a higher solids content.

Increasing milk prices

Milk pricing structures vary between different milk processors. The current milk pricing structure at Elsenburg is based on the amount of fat and protein produced with a bonus system to stimulate protein production. Deductions are made for transport cost based on the distance between the farm and the processing plant (starting at 30 km) and also milk quality based on somatic cell count and total plate count. According to this milk pricing structure, various options could be considered to increase the price of milk (Table 3). This includes options such as milking more cows (Option 2), increasing the milk yield per cow (Option 3), increasing the protein percentage of the milk (Option 4) or milking an even larger number of cows (Option 5).

By milking 10 cows, the price of milk for this herd is 200 c/litre. By increasing the number of cows in the herd to 82, the price of milk increases by 15 c/litre. It is increased by another 2 c/litre when the average milk yield in the herd increases from 15 to 19.5 litres/cow/day. The same response is obtained when the protein content of the milk increases from 3.80 to 4.94%. When the average milk yield or protein percentage of the milk in a herd is increased to such an extent over a short period of time, would imply that this is a herd

with a high genetic merit and that cows were grossly underfed. These production levels are typical for Jersey cows. Therefore both options 3 and 4 would only be achieved over a number of years as the herd will have to be improved genetically to be able to produce at such high levels. The results are also small, only a 2 c/litre increase on the current milk price. Increasing the number of cows in the herd to 460 resulted in another 15 c/litre increase in the protein bonus. With this milk pricing structure, the best way to improve the milk price would be to increase the volume of milk produced by milking more cows. Different options need to be considered for every milk pricing structure. This makes recommendations regarding sire selection and the correct feeding and management programme to receive the best milk price very difficult.

Table 3 The effect of different options on the milk price realised for a Jersey herd

Parameters	Options				
	1	2	3	4	5
Number of cows	10	<u>82</u>	82	82	<u>460</u>
Daily milk yield (kg)	15	15	<u>19.5</u>	15.0	15
Protein (%)	3.80	3.80	3.80	<u>4.94</u>	3.80
Protein volume premium (c/litre)	0	15	17	17	30
Milk price (c/litre)	200	215	217	217	230

Increasing the volume of milk

The variation between cows in milk yield is large and high milk yield levels are possible. Increasing the milk yield of cows is usually easy because it mainly involves feeding more and higher quality feeds. The amount of milk dairy cows produce, is dependent on their total energy intake. The amount and quality of the forages (pasture, hay or silage) and supplementary concentrates determine the total energy intake of cows. The condition of the cows at calving also affects the amount of milk cows produce.

Increasing the milk composition of milk

It is difficult to increase the fat and protein percentages of milk by feeding because it involves contrasting feeding regimens. To increase the protein percentage in the milk, more energy in the diet is needed. This is usually supplied by feeding more or a higher quality concentrate mixture. By increasing the amount of concentrates in the diet, cows may start to ruminate less because of a shortage of fibre. This reduces the saliva production of cows resulting in a more acidic rumen. This reduces the number of acetic acid producing bacteria in the rumen and that results in milk having a lower fat percentage. Artificial buffers must then be included in the diet to protect the rumen against high acidity levels and a drop in fat percentage.

The total diet of dairy cows should always contain a minimum roughage level. For higher fat percentages more roughages or artificial buffers must be included in the diet to keep the acidity level in the rumen higher. This effectively puts a limit on the maximum amount of concentrates in the diet. For cows on pasture additional roughages such as hay or straw are sometimes fed in an effort to increase rumination and to maintain or improve the fat percentage in the milk. This, however, could lead to a lower total feed and energy intake with a reduction in the milk yield and protein percentage. This could ultimately result in a reduced milk price and therefore milk income. According to the milk production results in a study where straw was fed additionally to cows on pasture, the net improvement in the milk price was small (less than 1 c/litre) without regarding the extra cost of feeding the straw.

Sire selection

Based on heritability estimates, the genetic effect on milk production and milk composition in dairy herds is medium to high. The genetic relationship between milk volume and fat or protein yields is high and positive, while the relationships between volume and percentages are negative. Emphasizing the volume of milk could result in milk with a lower solids content. This is to the disadvantage of dairy processors. With a high emphasis on fat and protein percentages the volume of milk could be reduced to the disadvantage of farm income. A payment system based on prices paid per kg fat and protein provides little financial incentive

to produce high solids milk. Sires are often labelled as high volume or high component bulls. In the ranking sires according to their genetic income (based on a payment system for kg fat and protein) it is often found that high component bulls rank lower than high volume bulls. This is because of lower fat and protein yields. Changing the genetic status of dairy cows in terms of milk volume and components is possible, although difficult. This is dependent on a long-term strategy, and different sire selection criteria are needed both on the farm and by AI companies.

Conclusions

The milk pricing structure of dairy processors affects the feeding and breeding programmes in dairy herds. A milk pricing structure based on fat and protein yields results in an increase in the volume of milk. This is in contrast to the requirement of dairy processors who need milk of high fat and protein percentages. A penalty on milk volume does not provide enough financial incentive to increase the fat and protein percentages in milk. The financial implications of feeding supplementary roughages or concentrates to change the fat or protein percentage in milk should be considered holistically. There is little incentive to feed straw to cows on pasture to improve the fat percentage in the milk if that results in less milk and a lower protein percentage and a reduction in the milk income. Milk pricing structures of dairy processors should include the volume of milk produced and the percentages of fat and protein in the milk. A sliding scale should be used emphasizing higher fat and protein percentages. This will provide the financial incentive to farmers to adopt appropriate feeding, breeding and management strategies to supply a product that accords with the requirements of dairy processors.