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# **Milk Segregation on Dairy Farms**

**A thesis presented in partial fulfilment  
of the requirements for the  
degree of Doctor of Philosophy  
in Agricultural Systems and Management  
at Massey University**

**Anne Elizabeth Dooley**

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# MASSEY UNIVERSITY

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## ABSTRACT

Milk composition varies between herds, and between cows within herds. The opportunity therefore exists to segregate milk from cows with different milk composition on farm, based on its suitability for the manufacture of particular dairy products. Benefits can result from increased yields, reduced processing costs or the suitability of differentiated milk for the production of high value niche market products.

A model was developed to determine the break even premium required for farmers producing differentiated milk to be no worse off economically than under the status quo. This model incorporated breeding (quantitative and qualitative traits), cow requirements and feeding, transport, and economic sub-models. Cows were segregated within herd and milk composition was altered over time by breeding. Four quantitative trait ("white" milk colour) scenarios and two qualitative trait (BB  $\beta$ -lactoglobulin milk) scenarios were considered. Manipulation of milk composition by feeding was allowed for in the model, although an example was not modelled. The transport model was developed to calculate the increase in milk collection costs associated with differentiated milk and this extra cost was included in the milk volume charge. A cost-benefit analysis was run over 20 years using a partial budget approach. This timeframe allowed for the long transition time required to manipulate milk composition by breeding. The breakeven premium on the status quo milksolids price was calculated over 10 year, 20 year and infinity time periods at a 7% discount rate.

Milk selection on a "differentiated" trait can lead to lower genetic gain in other production traits compared to the status quo. Lower production per cow allows for higher stocking rates (and therefore increased costs), and lower production per hectare. The scenarios modelled also included initial setup costs e.g. vat, cow testing, cow purchase. Sensitivity analyses were conducted on transport costs, premiums, and discount rates. The possibility of redistributing premium payments so a higher price was paid in earlier years was also explored.

The premium required to break even for the quantitative scenarios was \$1.11/kg of "white" milkfat over 20 years. The lower production of the "white" milk cows compared to their status quo counterparts had a considerable impact on the premium. The premium was lower (\$0.46/kg milkfat) where a greater proportion of the cows produced "white" milk in year 1. The premium required for the qualitative scenarios was lower, requiring an extra 3.4% to 4.1% for differentiated milkfat and protein compared to the status quo to break even over 20 years. Production per cow was similar to the status quo for these scenarios, and transport costs contributed to a high proportion of the premium required. Risk associated with a discontinuance of a differentiated milk policy is high. The breakeven premium required was considerably greater when a premium was received for only a few years e.g. \$0.92/kg milkfat for 20+ years compared to \$9.66/kg milkfat if the premium was discontinued after 10 years.

The rate of technology adoption will be important to the success of a differentiated milk policy. The premium required for milk differentiation policies may need to be considerably greater than the breakeven value to compensate for risk and encourage technology adoption. Farmers already producing milk closer to the required specifications could initially be targeted. Companies may need to consider taking some of the risk e.g. through price redistribution. Effective strategies involving both industry and farmers will need to be developed to facilitate the uptake of milk segregation. This research model could be used by dairy companies and farmers considering milk segregation policies.

**Keywords:** milk segregation, modelling

**Title:** Milk segregation on dairy farms.

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