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**DETERMINING PREMIUM PAYMENTS FOR
CONCENTRATION OF UNSATURATED FATTY ACIDS IN
MILKFAT IN NEW ZEALAND BASED ON CHANGES IN
FARM AND PROCESSOR PROFIT**

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*Dedicate to my wife and daughters, who
supported me each step of the way*

ABSTRACT

Niche markets have emerged for dairy products with a high concentration of unsaturated fatty acids (UFA) in milkfat. Several studies have indicated that although milkfat UFA concentration could be increased on-farm by manipulation of the diet and genetic selection, farm profit could be negatively affected in the absence of a premium for milkfat UFA concentration. The objective of this study was to estimate, via simulation, a premium for milkfat UFA concentration, for dairy farmers in New Zealand that segregate cows, or feed oilseed supplements to dairy cows, to produce milk high in UFA. Data from New Zealand Holstein-Friesian cows were used to develop a stochastic farm model that simulated the physical and financial performance of dairy farms under New Zealand conditions. The farm model was then used to simulate a population of 1,820,000 cows and 5,600 dairy farms. From the population simulated, the top 17,150 cows for milkfat UFA concentration were segregated and randomly distributed onto 50 farms (UFA farms). The farm model was also used to simulate a group of 50 farms on which an oilseed supplement was fed to dairy cows during lactation (OILSEED farms). The characteristics of UFA farms and OILSEED farms were compared with those of 50 average farms (AVE farms). A deterministic milk processing model was used to simulate a dairy processor that processed and marketed the milk produced by AVE farms, UFA farms and OILSEED farms. A milk payment system which paid dairy farmers for milkfat (\$/kg), protein (\$/kg) and milkfat UFA concentration (\$/kg milkfat), but penalised milk volume (\$/L), was developed using data corresponding to the physical and financial performance of the dairy processor and the three groups of dairy farms simulated. In the absence of a premium for milkfat UFA concentration, the operating profit (\$/ha) of UFA farms and OILSEED farms was significantly lower than that of AVE farms. For UFA farms, a premium of \$0.47 to \$0.51 /kg milkfat for each 0.1 g UFA/100 g milkfat increase (above 34.50 g UFA/100 g milkfat) equalled their operating profit (\$/ha) to that of AVE farms. For OILSEED farms, a premium of \$0.10 to \$0.14 /kg milkfat for each 0.1 g UFA/100 g milkfat increase (above 37.50 g UFA/100 g milkfat) equalled their operating profit (\$/ha)

to that of AVE farms. These premiums for milkfat UFA concentration could help New Zealand dairy companies to further evaluate whether it is economically viable producing and processing milk high in UFA.

Keywords: unsaturated fatty acids, stochastic farm model, milk processing, premium, milk payment.

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LIST OF ABBREVIATIONS

ALA	α -Linolenic acid
BMP	Butter milk powder
c9 t11 CLA	cis 9 trans 11 conjugated linoleic acid
CCC	Concordance correlation coefficient
CHD	Coronary heart disease
CLA	Conjugated linoleic acids
DGAT1	Diacylglycerol O-acyltransferase 1
DHA	Docosahexaenoic acid
DIM	Days in milk
DM	Dry matter
EPA	Eicosapentaenoic acid
F%	Milkfat percentage
FTIR	Fourier transform infrared spectroscopy
HDL	High-density lipoprotein
LDL	Low-density lipoprotein
LW	Live weight
ME	Metabolisable energy
ME_l	Metabolisable energy for lactation
ME_{lwc}	Metabolisable energy for live weight change
ME_m	Metabolisable energy for maintenance
ME_p	Metabolisable energy for pregnancy
MIRS	Mid-infrared spectroscopy
MJ	Mega joules
MS	Milksolids (milkfat + protein)
MUFA	Monounsaturated fatty acids
MY	Milk yield
n-3 and n-6	Omega 3 (ω -3) and omega 6 (ω -6) polyunsaturated fatty acids, respectively
NIRS	Near-infrared spectroscopy
P%	Protein percentage
PUFA	Polyunsaturated fatty acids
RPE	Relative prediction error

SCD	Stearoyl-CoA esaturase
SFA	Saturated fatty acids
SMP	Skim milk powder
TFA	Trans fatty acids
UFA	Unsaturated fatty acids
WP	Whey powder