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Economic costs of recorded reasons for cow mortality and culling in a pasture-based dairy industry

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ABSTRACT

The objective of this study was to determine the economic costs associated with different reasons for cow culling or on-farm mortality in a pasture-based seasonal system. A bioeconomic model was developed to quantify costs associated with the different farmer-recorded reasons and timing of cow wastage. The model accounted for the parity and stage of lactation at which the cows were removed as well as the consequent effect on the replacement rate and average age structure of the herd. The costs and benefits associated with the change were quantified, including animal replacement cost, cull salvage value, milk production loss, and the profitability of altered genetic merit based on industry genetic trends for each parity. The total cost of cow wastage was estimated to be NZ$23,628/100 cows per year (NZ$1 = US$0.69) in a pasture-based system. Of this total cost, NZ$14,300/100 cows worth of removals were for nonpregnancy and unknown reasons, and another NZ$3,631/100 cows was attributed to low milk production, mastitis, and udder problems. The total cost for cow removals due to farmer-recorded biological reasons (excluding unknown, production, and management-related causes) was estimated to be NZ$13,632/100 cows per year. Of this cost, an estimated NZ$10,286/100 cows was attributed to nonpregnancy, mastitis, udder problems, calving trouble, and injury or accident. There is a strong economic case for the pasture-based dairy industries to invest in genetic, herd health, and production management research focused on reducing animal wastage due to reproductive failure, mastitis, udder problems, injuries or accidents, and calving difficulties.

Key words: economic cost, dairy cow culling, pasture-based dairy industry

INTRODUCTION

To meet the growing demand for dairy products worldwide, an increase in milk production per cow has been driven through genetic selection for greater production efficiency and improvements in nutrition and management (Rauw et al., 1998; Oltenacu and Broom, 2010). Although this has been beneficial in terms of milk production, there are growing concerns that continual genetic selection for high production efficiency in dairy cows is increasing the risk of behavioral, physiological, and immunological problems (Rauw et al., 1998) and, consequently, the risk of health disorders, premature culling, or death on farm (Beaudeau et al., 2000; Mulligan and Doherty, 2008). Thus, genetic, nutrition, and management research to improve the lifetime productivity of dairy cows is becoming a focus worldwide (Beaudeau et al., 1996; Mulligan et al., 2006; Pritchard et al., 2012). Expected benefits from improving lifetime productivity include more productive dairy herds due to improvement in average age and therefore lifetime milk production (Horan et al., 2005; Walsh et al., 2007), reductions in costs due to requiring fewer replacement animals (Bach, 2011; Mohd Nor et al., 2015), and a reduction in costs due to fewer health treatments and performance-limiting health disorders (Beaudeau et al., 1995; Fourichon et al., 1999). Healthier and more robust cows are also easier and less labor intensive to manage, with improvements in the length of cow productive life reflecting positively on animal welfare (Oltenacu and Algers, 2005; de Vries et al., 2014), the environment (Beukes et al., 2010), and, consequently, the general public and consumer perception of dairy farming.

There is, however, a current lack of detailed understanding of why or when cows are exiting herds in pasture-based dairy industries. This gap in knowledge means that we cannot track survival or mortality trends over time, making it difficult to target research at the most important issues. The objective of this work was to understand when cows are exiting herds and to determine the economic costs associated with differ-

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Table 1. Total number of cows assigned to each fate reason group for reproductive, health, other, physical, performance, management, and unknown reasons

Type	Fate reason group	Individual fate reasons include	Total (n ×10^3)	Percentage (%)
Reproduction	Abortion	Abortion	65.7	0.7
	Nonpregnant	Empty	3,144.7	33.4
	Fertility	Infertility or low fertility, late calver, low fertility	77.6	0.8
Health	Bloat	Bloat	120.8	1.3
	Calving trouble	Calving trouble (inseptecemia)	125.2	1.3
	Disease	Brucellosis, bovine viral diarrhea, caprine arthritis encephalitis, cancer, catarrh, humane, sickness, infectious bovine rhinotracheitis, Johne's disease, leptospirosis, listeriosis, other diseases, *Salmonella*, scours, tuberculosis, pneumonia	158.9	1.7
	Eczema	Eczema, facial	758	0.8
	Foot or leg	Foot or leg problems, leg problems, lame	165.0	1.8
	Grass staggers	Grass staggers	14.9	0.2
	High SCS	High SCS	270.5	2.9
	Injury or accident	Injured, culled, died or injured, drowned, humane, injury, electrocution	154.6	1.6
	Hypomagnesemia	Magnesium staggers	18.2	0.2
	Mastitis	Mastitis	353.2	3.8
	Milk fever	Milk fever	98.7	1.1
	Other metabolic disorders	Ketosis, other metabolic disease	1.8	0.02
Other	Other, known recorded fate	Parent performance, cast, failed veterinary examination, low libido, poor service behavior, natural proof, below standard, unsatisfactory or non-server, artificial breed proof not up to standard, progeny test below standard, sires proof below standard	50.4	0.5
Physical	Udder problems	Blind quarter, slow milker, 3 titter, udder breakdown, unsuitable udder or teats	353.5	3.8
	Traits other than production	Teeth, traits other than production, unsuitable type, weight gain below standard, conformation	32.3	0.3
Performance	Culled for age	Old age	378.2	4.0
	Low production	Low production	807.9	8.6
Management	Sold, reasons unknown	Store, slaughter, surplus to requirements, breeding worth, export	132.9	1.4
	Temperament	Unsuitable temperament	60.2	0.6
Unknown	Unknown	Other causes, cull to layoff, died, cause unknown, unknown	2,752.2	29.2
Total			9,411.4	100.0

ent reasons for cow wastage, due to culling or on-farm mortality, in a pasture-based seasonal dairy industry.

MATERIALS AND METHODS

Data Source and Management

The New Zealand dairy industry national animal data set (n = 46,520,335) was filtered to obtain records between 1990 and 2013 for cows 2 yr or older with a fate type of died on farm (n = 2,518,224), culled (n = 13,875,888), or sent to slaughter (n = 5,284). Cow records missing a fate reason or fate date (n = 6,988,011) were removed, leaving 9,411,385 records, which were aggregated into 23 groups of similar fate reasons (Table 1). These data were then cross-classified in 3 different ways. The first involved describing the overall proportion of different farmer-recorded reasons contributing to cow wastage, including biological (reproductive, health, other, and physical reasons), performance and management, and unknown reasons (Table 1). The second involved describing the proportion of recorded reasons by parity (Table 2). Because calving is seasonal in pasture-based systems, parity (values ranging from 1 to 7+) was quantifthe calving year before the wastage event minus the year of birth. The third involved describing the proportion of recorded reasons by stage of lactation. Stage of lactation was defined as the recorded fate date minus last calving date (beginning = 0–30 DIM; early = 30–90 DIM; mid = 90–200 DIM; late = 200–330 DIM; extreme = 330+ DIM).

Quantifying Costs of Different Reasons for Cow Wastage

A bioeconomic model was developed to quantify costs associated with the different reasons and timing for wastage. The model first considered the parity that cows exit and the consequent effect this had on the replacement rate and average age structure of the herd. The model then considered the effect this had on replacement cost, carcass salvage value, milk produc-