Can on-farm animal welfare explain relative production differences between dairy herds?

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Abstract

The aim of this study was to investigate factors responsible for between-herd variation in milk production, when genetic variation is controlled. Quantitative information regarding farms’ production environment and animal welfare, as evaluated annually by veterinarians and health and feeding records, were the factors studied. Principal component analysis was used to reduce the production environment variables as well as the welfare data. Two linear regression models were devised. The first model used welfare indicators and veterinary treatments to predict the difference between herds’ observed and potential milk yield. The second model explained the residual of the first model by feeding and animal-based indicator data. Together, these two models explained 62% of the variance in milk yield differences between herds. Specifically, feeding of the herd was the most important factor, accounting for 67%, followed by the production environment/animal welfare (30%) and finally animal health, assessed through veterinary treatments, explained the remaining 3% of the variance. A poor welfare rating adversely affected milk production. Similarly, a low score for fatness at slaughter, poor milk quality and high mortality all showed a clear negative association with production. It was found that while feeding remains a major factor, production environment and animal welfare also have significant roles to play when it comes to production. Notably, those farms with major animal welfare problems were shown to display milk yield below the Finnish average.

Keywords: animal welfare, dairy cattle, feeding, milk production, principal component analysis, routine herd data

Introduction

There is a paucity of literature looking into the association between on-farm welfare assessments and milk production. Yet, demonstration of a positive association between animal welfare and farm profitability could have the potential to stimulate investment in improvements to cow comfort and welfare by dairy farmers (Villettaz Robichaud et al 2018). Coignard et al (2014) compared milk yield (test days) with a welfare score attained using the Welfare Quality® (WQ) protocol (Welfare Quality® 2009a). The score for good health (WQ principle) and the average of all four WQ principle scores were associated with milk yield, whereby those farms scoring the lowest had the higher producing cows. On the other hand, lower scores in the WQ criteria expression of social behaviour and positive emotional state were associated with reduced milk yield. Thus, the relationship between animal welfare and milk production appears to be multifaceted.

The development of WQ (Welfare Quality® 2009b) has enabled quantitative measurement of animal welfare to be carried out. However, WQ protocols are considered impractical and time-consuming for routine assessment of animal welfare (eg Knierim & Winckler 2009; Heath et al 2014). The estimated duration of a dairy cattle assessment is 5–8 h depending on the size of the herd (Welfare Quality® 2009a). Thus, WQ is not routinely used and cheaper, less time-consuming methods of on-farm welfare assessments are increasingly sought. Several national welfare monitoring systems which are similar in approach to WQ, but more simplified, are used or are under development, for example, in Denmark (Andreasen et al 2014), The Netherlands (Metz et al 2015) and Italy (Bertocchi & Fusi 2014).

Data related to herd productivity, health and fertility are routinely collected from dairy farms in developed countries, and many studies have shown this routine herd data to be associated with several on-farm welfare indicators (de Vries et al 2011). For example, it has been suggested that indicators reflecting issues with fertility and high mortality in different age groups, are potential indicators of poor welfare as well (Sandgren et al 2009; Krug et al 2015). These indicators may reflect problems in stockmanship and management (Sandgren et al 2009). Nyman et al (2011) tested routine herd data against nine animal-based, on-farm welfare measures (eg body condition score [BCS], cleanliness, lameness, injuries). In total, 28 herd data indicators