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Case Study: Animal bedding cost and somatic cell count across New England dairy farms: Relationship with bedding material, housing type, herd size, and management system

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ABSTRACT

Research on bedding material for dairy farmers typically focuses on microbial growth and associations with SCC. With few exceptions, information on cost or why farmers select specific bedding materials is absent from the literature. This survey study of conventional and organic dairy farmers from the 6-state New England region addresses these gaps, by exploring the relationship between bedding material cost and producer-reported SCC with bedding selection, housing type, farm scale, and management system. Survey analysis of 129 New England dairy farmers showed that the primary bedding materials used by respondents from conventional farms were sawdust, sand, and wood shavings, whereas organic farmers predominantly used sawdust, hay, and sand. From 2003 to 2013 the real cost of bedding material for survey respondents increased by 70% for conventional dairy farmers ($85 to $184/cow per year) and 71% for organic dairy farmers ($67 to $145/cow per year). Of the various bedding materials used by respondents, the cost of wood shavings was more costly than other bedding materials for both conventional and organic dairy farmers. Respondents using freestalls had lower bedding material costs than other housing types, especially those using bedded packs, which had the highest material costs for both management systems. For conventional and organic farms, bedding cost decreased as herd size increased. When analyzing producer-reported SCC, no trends were apparent with housing type, herd size, or management system. However, respondents using sawdust reported elevated SCC when compared with producers using other bedding materials.

Key words: animal bedding cost, somatic cell count, bedding material, housing type, management system

INTRODUCTION

One of the crucial factors in maintaining a healthy dairy herd is having sanitary animal bedding. This is because of the frequency and duration of contact between the cow and bedding material. Dairy cows will often lie down 8 to 16 h/d if given the opportunity (Tucker et al., 2009). Importantly, extended time spent standing or lying down on unsanitary bedding increases the risk of environmental mastitis (Hogan et al., 1989). With bedding being one of the primary sources of exposure to environmental mastitis pathogens (Ruegg, 2006), the management of this material is important in maintaining herd health and the economic vitality of the farm.

In the highly forested region of New England, bedding from mill waste (sawdust and planer shavings) has historically been the most common and inexpensive product. However, there has been a continual decrease in the number of mills operating regionally over the last few decades. This problem accelerated in 2005, due to the collapse in the new home construction market, and went further in 2007 to 2009, due to the recession (Woodall et al., 2012). Increased mill efficiency and modernization also reduced the amount of mill by-product available for bedding. The combination of these supply disruptions has increased regional bedding costs, forcing dairy farmers to pay more or find alternative bedding materials. Consequently, this survey study was developed to determine what the current state of bedding usage and cost are across the 6 New England states. The objectives of this study are to assess the following: (1) what bedding materials are New England dairy farmers using, and why; (2) what percentage of dairy farmers experienced increased bedding costs over the last decade, and how were those costs managed; (3) what is the current annual bedding material cost per cow; (4) does bedding material, housing system, farm scale, or management system relate to producer-reported SCC or bedding cost; and (5) is there interest in the on-farm production of animal bedding using a wood shaving machine as a potential cost-saving and revenue-generating alternative.

The authors declare no conflict of interest.

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MATERIALS AND METHODS

Survey Tool and Questions

The survey tool used for this study was a mailed questionnaire, followed by an online version sent via email to those not responding to the paper mailing (the survey appears in the Supplemental Material; https://doi.org/10.15232/pas.2016-01601). The questionnaire was developed over a 6-mo period, with assistance from experts in the field of dairy and natural resource management. Research questions and the cover letter for the questionnaire were pretested using a focus group of university dairy farm managers and researchers. Cognitive interviewing was used during the focus group, to understand how individuals were interpreting each question and whether the group was interpreting questions consistently. This same group was also asked to validate the content of the questionnaire as a whole, to ensure it accurately addressed the specific research questions being asked. The focus group was also asked to carefully analyze the content of the cover letter, which described the aim of the study, who was conducting it, how the information would be used, the respondent's rights as a human subject, assurance of their confidentiality, and informed consent (right to participate or not). Upon completion, the questionnaire was provided to the University of New Hampshire Institutional Review Board for the Protection of Human Subjects in Research (**IRB**), which approved the study under IRB exempt status. Following IRB approval, the refined questionnaire was pilot tested by a small sample of the target population (3 organic farmers and 2 conventional farmers) to determine the ease, quality, and time requirement of the questionnaire. This process led to the omission of 2 questions for a final questionnaire of 28 questions. The online version of the questionnaire was also pilot tested by 3 members of the research team to ensure all links worked and the visual presentation made sense.

For reference, the survey question regarding SCC asked dairy farmers to report the herd average SCC over the past year, whether those values were from DHIA or from the milk plant. These producer-reported SCC values were not cross-referenced with DHIA or milk plant records. However, Wenz et al. (2007) conducted a questionnaire with producer-reported SCC, where a subset of the population was cross-referenced, and found that most producers across the 21 surveyed states did not underestimate SCC and that the producer-reported SCC was an accurate representation.

Sample Size and Selection

The target population for this study was conventional and organic dairy farm managers with active operations in the New England region. The initial goal was to obtain addresses for the entire population of regional dairy farmers (2,207 conventional and 250 organic; USDA, 2012, 2014). However, addresses for the entire population of conventional or organic dairy farmers were not publicly available. As such, an exploratory or case study approach was used, with purposive nonrandom sampling to develop the survey sample.

Addresses for conventional dairy farmers (both physical and email) used to develop the sample were obtained through state and national online directories. The primary directories used to obtain addresses were the New England States Holstein Association (Wells River, VT), American Jersey Cattle Association (Reynoldsburg, OH), US Ayrshire Breeders' Association (Columbus, OH), and the American Guernsey Association (Columbus, OH). Participants for dairy farms using organic management were obtained from Organic Valley (La Farge, WI) and Moo Milk (Augusta, ME), who mailed questionnaires to their constituents on behalf of the research team, to maintain the privacy of their constituents.

Questionnaire Mailings

Questionnaires were sent by first class mail on March 17, 2014, to 395 conventional dairy farmers (18% of the regional population) and 212 organic dairy farmers (85% of the regional population). A deliberate, late-winter mailing was selected to increase the response rate, because spring, summer, and fall are typically busier times of the year for dairy farmers. On May 9, 2014, the online version of the questionnaire was sent to dairy farm managers who did not respond to the mailed questionnaire. Farm managers were contacted by email with a link to the questionnaire, which was developed in SurveyMonkey (San Mateo, CA). One week following the first email, a reminder email was sent with a link to the questionnaire to those who had not responded to the first request. Only 35 dairy farmers were contacted using the online questionnaire, due to a lack of publicly available email addresses.

It is important to note that surveys were sent to all the dairy farmers compiled in our database. This was a deliberate decision and was based on reducing the issue of having a low response rate within the various study subgroups. More specifically, it was hypothesized that there would be a wide variation in responses based on the combination of management system, bedding material selection, housing type, and farm scale. With such a wide range of possible combinations across farms, it was decided that using all the contacts would reduce the risk of having small samples sizes within groups, which would mask potential trends. Furthermore, because analyses were descriptive and split by management system, there was not a concern regarding sending a greater proportion of the organic dairy industry questionnaires than those using conventional management.

Data Analysis

Raw data from both the mailed and online questionnaires were compiled in Microsoft Excel. Data were entered by one member of the research team, with every