The Professional Animal Scientist 33:409–419
https://doi.org/10.15232/pas.2016-01581

ARPAS
AMERICAN REGISTRY OF PROFESSIONAL ANIMAL SCIENTISTS

Nutrition, reproduction, and young stock performance on dairy farms throughout Illinois: A Dairy Focus Team approach

M. I. Rivelli, S. Y. Morrison, PAS, K. J. Haerr, PAS, S. Rodriguez Zas, and F. C. Cardoso[1]
Department of Animal Sciences, University of Illinois, Urbana 61801

ABSTRACT

The world dairy industry has been changing over the last decades, and Illinois dairy farms are not an exception to these transformations. The objective of this study was to develop research and educational data that could help farmers to identify improvements and opportunities. To evaluate potential nutritional, reproductive, and young stock management opportunities, a total of 20 farms in Illinois were visited from May through June 2014.The farms were divided between the northern (NOR) and southern (SOU) regions of Illinois. During the visit to each farm, a questionnaire, DHI records along with the individual farm data set, samples of corn silage and TMR, and weather (ambient temperature, relative humidity, and wind speed) measurements were collected by a trained team of university and industry scientists. Average herd size was 413 ± 192 and 451 ± 949 lactating and dry cows for NOR and SOU, respectively. Average daily milk yield per cow was 37.9 ± 6.7 kg and 33.8 ± 5.7 kg for NOR and SOU, respectively ($P = 0.21$). Mean density of corn silage was greater for SOU than NOR (221.2 ± 8.2 vs. 168.5 ± 12.2 kg/m^3, $P = 0.003$). Dry matter content of the TMR offered to both lactating and dry cows was greater for NOR than SOU (48.7 ± 1.7 vs. 44.1 ± 1.0%, $P = 0.006$). Yearly pregnancy rate (19.8 ± 2.2 vs. 12.6 ± 1.6; $P = 0.006$) was greater for cows and heifers in NOR than SOU. Results suggested that geographical aspects such as weather differences (NOR vs. SOU) are important factors related to performance of dairy farms. Educational and extension programs tailored to the aforementioned differences might be more effective.

Key words: management, nutrition, reproduction, young stock

INTRODUCTION

The USDA (2007) reported that the number of farms with <50 cows has been decreasing and the number of farms with >100 cows has been increasing since 1991. Illinois dairy farms have experienced similar changes that have led to a 57% decrease in the number of total dairy farms and to a 40% increase in the average herd size during a 30-yr period (USDA, 2007). The emergence of new technologies and consumer concerns about food quality are changing the dairy industry. Farms are more productive because of their investment in new technologies and their implementation of targeted management programs (Brotzman et al., 2015). However, implementation of new technological and management practices is not always economically feasible (von Keyserlingk et al., 2013).

Knowing potential causes of inefficiency and efficiency of a farm is pivotal in improving its performance (Solís et al., 2009). To improve profits, dairy farmers need to optimize their operation's reproduction, management, and milk production simultaneously (Galligan, 2006). Productivity levels are linked to improvements in technology and efficiency, not to farm size (Cabrera et al., 2010).

Illinois data are in agreement with those described by the USDA (2007); therefore, it is necessary to develop new strategies that allow both small and large operations to improve farm efficiency. Dairy producers need to better understand how their own farms are performing and what the potential causes of inefficiency are. Overall, researchers' or government agencies' perspectives and goals are not necessarily the same as those of farmers; it is because of this that information should be focused on meeting the concerns or necessities of individual producers (Villamil et al., 2008).

Therefore, the objectives of this study were (1) to characterize the nutritional, reproductive, and young stock management practices of Illinois dairy farms and (2) to study potential geographical differences between the northern and southern regions in Illinois. Both objectives could provide important insight that may help dairy farmers and their advisors improve performance of their operations.

MATERIALS AND METHODS

Dairy Focus Team Approach

The Dairy Focus Team was established in 2014 as part of an extension program that encourages graduate and undergraduate students to further their knowledge by getting hands-on experience evaluating dairy farms as well as working with dairy producers to maximize profitability. The Dairy Focus Team was set up with a hierarchal structure of organization. The CEO is the faculty member and

[1] Corresponding author: cardoso2@illinois.edu

primary advisor of the team. Under the CEO, the president is a senior graduate student responsible for overseeing the training and management of the other chairpersons for each of the 5 individual sections to be evaluated on farm. The chairpersons were graduate students who were selected for the position based on their area of interest and experience. Each chairperson was responsible for the following sections for which they were assigned: nutrition, management, milk quality, reproduction, and young stock. Under each chairperson there were other graduate and undergraduate students who were interested in the section they were involved in and whose purpose was to learn and support the chairperson for each section during farm visits and during the postvisit evaluation of each farm. Additionally, the team had 2 groups of dairy mentors: one group of faculty and one group of industry members who were identified as additional knowledge and support to achieve the Dairy Focus Team objectives.

To standardize data collection a questionnaire was developed. Also, forms for each section were developed to ease data collection and to record specific information from each section (e.g., number of stalls in each pen, and number of cows drinking in each pen). All students were trained on how to use these forms, how to collect samples, and how to record measurements (e.g., wind speed, relative humidity, and temperature) by the respective chairperson of the section for which the form information would be used. During each farm visit the CEO, president, and chairpersons of each section all visited the farm. If a chairperson was unable to make the visit, then a trained member of the section went to the farm to collect the necessary data. After the initial visit and analysis the team got together and made the recommendations. The CEO and the president built up a report that contained all the farm analysis and recommendations. This report was mailed to each farmer with a personal code that allowed them to compare their data with those of the other farms visited during regional meetings where all results were presented (e.g., the regional Illinois Dairy Summit meetings held in northern, central, and southern Illinois sponsored by Illinois Milk Producers Association and University of Illinois Extension).

Research Approval

The University of Illinois Institutional Review Board (IRB # 14636) approved all procedures that were performed in this research. Prior to answering the questionnaire and sampling, all participants read and signed a consent letter that ensured confidentiality.

Farm Selection

For this study, a total of 20 dairy farms were selected based on their previous approval and willingness to participate in the study. Farms located north of Interstate 80 (latitude: 41°31′N) were classified as northern (**NOR**) and those located south of Interstate 80 as southern (**SOU**) farms. Fourteen of the farms were located in SOU (Piatt, McLean, Livingston, Tazewell, Brown, Marion, Shelby, Bond, Perry, St. Clair, and Vermilion counties), and 6 were located in NOR (Jo Davies, Stephenson, Carroll, Dekalb, and Rock Island counties). Minimum distance was 110 km and maximum distance was 492 km between northern and southern farms. Minimum and maximum distance between 2 farms was 9 and 492 km, respectively.

Questionnaire and Data Collection

A single visit from the team was conducted on each of the 20 farms selected. During each visit a questionnaire was administered by the CEO to the producer (owner) of each farm in a one-on-one interview. The questions were administered by a single person so that answers were in a similar format and were asked in a similar manner for all farms. The questionnaire had 6 sections: goals, management, dairy herd characteristics, nutrition, reproduction, and young stock. Nutrition, reproduction, and young stock sections were analyzed in this study (Table 1).

Simultaneously, the members of the Dairy Focus Team who were present for the farm evaluation collected corn silage (**CS**), TMR, and manure; and ambient temperature (**TEM**), relative humidity (**RH**), and wind speed measurements were collected. Also, DHI records along with an individual farm data set extracted from PCDART (Dairy Records Management Services, Raleigh, NC), Dairy Comp 305 (Valley Ag Software, Tulare, CA), Dairy Plan C21 (GEA Farm Technologies Australia Pty. Ltd., Tullamarine, Victoria, Australia), or AgriTech Analytics (Visalia, CA) herd management software were collected. Data were exported to Excel (Microsoft Corp., Redmond, WA) to build a final data set. Means and associated SD for milk yield and composition from the last test day (e.g., closest to the visit) and yearly values are shown in Table 2.

Nutrition

Trained personnel from the team collected CS, TMR, and manure samples. Samples of CS and TMR were taken on each farm and were sieved with the Penn State Particle Separator to determine particle size distribution (Kononoff et al., 2003). Corn silage and TMR samples were brought to the laboratory and dried at 55°C in a forced-air oven for 3 d (AOAC International, 1995) and then ground to pass through a 1-mm screen (Thomas Scientific, Swedesboro, NJ). Samples of TMR and CS were analyzed for contents of DM, CP, ADF, NDF, starch, sugar, Ca, P, Mg, and K using wet chemistry methods (Schalla et al., 2012) at a commercial laboratory (Rock River Lab, 2014).

Corn silage density (**CSD**) was measured on those farms that had either corn silage piles or bags (n = 4 in NOR; n = 11 in SOU). Density measurements were performed with a forage probe (Dairy One, Ithaca, NY) attached to a drill. Density samples were obtained from 5 different areas of each pile or silo bag (upper left, upper right, center, lower left, and lower right). Samples were weighed