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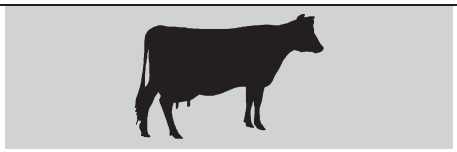

Case Study: A comparison of production, reproduction, and animal health for pastured dairy cows managed either conventionally or with use of organic principles

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ABSTRACT

This study examined a seasonally calving pasture-based dairy herd in North Carolina divided into 2 groups of cows that were managed either organically or conventionally with regard to health standards. The herd consisted of Holsteins, Jerseys, and crosses of various percentages between those breeds. The study aimed to compare the effect of organic versus conventional treatment strategies on overall production, reproduction, and animal health across 4 calving seasons within a pasture-based system. There were no differences ($P > 0.40$) in milk production or milk components between the organic and conventional management groups, but breed group differences showed Holsteins producing at higher levels than Jerseys ($P < 0.001$). Holsteins, reciprocal F_1 crosses between Holsteins and Jerseys, and crossbreds >50% Holstein had higher milk production and protein and fat production than Jerseys or cows >50% Jersey (all $P < 0.05$). Somatic cell score from the organic herd (3.09) was numerically lower than in the conventional herd (3.33; $P = 0.45$). Crossbred cows had ($P < 0.05$) higher 90-d pregnancy rates than purebred cows. Proportions of cows with clinical mastitis or milk fever were not different between the management groups. Incidences of other health events (blind quarters, cystic ovaries, lameness, metritis, respiratory issues, retained placenta, udder edema) were all low, each <1.4% and collectively <3.6% across groups. These results support the hypothesis that an organically managed herd can be competitive with a conventional herd in terms of production, reproduction, and animal health within a pasture-based system.

Key words: pasture based, organic, health, reproduction

INTRODUCTION

Organic dairy production in the United States increased from 2,265 cows in 1992 to 249,766 cows in 2008 (USDA, 2008). The organic sector has grown 5 to 20% annually since 1997 (Organic Trade Association, 2009, 2011). The USDA established the National Organic Program in 2002, which is responsible for maintaining the formulated guidelines for organic farms. The National Organic Program verifies that producers meet animal-health and welfare standards, use 100% organic feed, provide access to the outdoors, and do not use antibiotics or hormones (Electronic Code of Federal Regulations, 2013). Because antibiotics are not approved, organic producers use a variety of natural products for treatment of diseases such as mastitis (Pol and Ruegg, 2007; Mullen et al., 2013).

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Studies of organic and conventional dairies in the past have typically compared conventional dairies where cows have no significant outdoor access during lactation to pasture-centered organic dairies. A more recent comparison examined organic herds and conventional herds that used grazing to supply at least 30% of the DMI of lactating cows. Those researchers reported a higher risk of clinical mastitis in conventional grazing herds (Richert et al., 2013), significantly lower production in organic herds (Stiglbauer et al., 2013), and similar reproductive performance as measured by calving interval (Stiglbauer et al., 2013). Organic dairies were more likely to have crossbred cows (Stiglbauer et al., 2013), which could increase reproductive performance as shown in comparisons between purebred and crossbred cattle (Harris et al., 2000; Vibart et al., 2012).

This case study examines production, reproduction, and animal health in organically and conventionally managed herds within similar pasture-based dairy systems at one research location.

MATERIALS AND METHODS

Research Herd

Data were obtained from the pasture-based dairy of the Center for Environmental Farming Systems in Goldsboro, North Carolina, from 2009 to 2013. During this study, the dairy of the Center for Environmental Farming Systems was a seasonal, autumn-calving system. The intent was to supply as much of the nutritional needs of the cows from pasture as possible. The herd was divided into groups to be managed organically or conventionally for 4 yr starting with the calving season beginning in October 2009. Cows were assigned to management groups balanced by breed composition, age, and expected calving date as described by Mullen et al. (2014). The organically managed cows were not certified organic and received conventional feed supplements similar to the conventionally managed cows. However, for the 2 groups, comparable conventional and organically managed pasture paddocks were interspersed across the farm. Several combinations of cool- and warm-season grasses and legumes were used to provide close to year-round grazing in a temperate climate. Pasture species used were comparable within both systems and included mixtures of alfalfa (*Medicago sativa* L.) and bromegrass (*Bromus catharticus* and *Bromus willdenowii*), fescue (*Festuca arundinacea*) and Ladino clover (*Trifolium repens* L.), bermudagrass (*Cynodon dactylon*), summer annuals including sorghum-sudan hybrids (*Sorghum bicolor* × *S. bicolor* var. *sudanese*) and crabgrass (*Digitaria sanguinalis*), and winter annuals including cereal rye (*Secale cereal*) and annual ryegrass (*Lolium multiflorum*). Cows received variable amounts (between 3.6 and 7.3 kg/cow per day, depending on stage of lactation, season, and available pasture) of conventional concentrate, which included ground corn, soybean meal, whole cottonseed, and minerals, regardless of management group. Cows also received corn silage, baled hay, or haylage as supplemental forage during winter or during droughts as needed, depending upon pasture quality and quantity available.

Cows managed organically received no treatment or alternative strategies were used for managing udder health and reproduction. In the conventional group, cows were managed using conventional interventions as needed, including antibiotic therapy at dry-off and antibiotic treatment of mastitis. If conventionally managed cows were not detected in estrus during the first 6 wk of the breeding season, combinations of progesterone, prostaglandin $F_{2\alpha}$, and gonadotropin-releasing hormone were used sequentially to synchronize those cows to ensure they were inseminated at least once during the breeding season. Organic cows did not receive any synchronization hormones and were inseminated based on visual heat detection.

Disease treatments were similar between conventional and organic animals, except for some therapies not used in organic cows. Flunixin meglumine was used to mitigate pain in conventional and organic cows with retained placenta or lameness. All cows were given time to clear the placenta on their own, but in case of retention, conventional cows were given flunixin meglumine, vitamin B complex, and either penicillin or ceftiofur hydrochloride. Organic cows with retained placentas were given flunixin meglumine only. Cystic ovaries, metritis, and udder edema were not treated in the organic herd but were treated in the conventional herd using prostaglandin $F_{2\alpha}$, penicillin and prostaglandin $F_{2\alpha}$, and oxytocin and dexamethasone, respectively. Conventional cows with milk fever received 23% calcium gluconate, dextrose, CMPK paste (calcium, magnesium, phosphorus, and potassium supplement), and a calcium bolus. Organic cows with milk fever received 23% calcium gluconate and CMPK paste. The main difference in organic and conventional treatments is the use of antibiotics and synthetic hormones in the conventional herd.

Breeds and Breed Crosses

The herd had approximately 125 cows each calving season and consisted of Holsteins (**HH**), Jerseys (**JJ**), and crosses between those breeds. The crossbreeding system was designed so that each purebred cow was inseminated using semen from the same breed one year and from the opposite breed the following year. The same scheme was used in F_1 heifers and cows (**HJ** and **JH**, sire breed listed first) so that any F_1 cow had a calf that was 75% Holstein (**HX**) one year and 75% Jersey (**JX**) the next year. For subsequent crosses, all heifers and cows that were >50% of one breed were inseminated with the other breed, with resulting animals also being classified as JX or HX, respectively. Cattle were inseminated during January through March, with calving from October until early January.

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