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Drinking water requirements for lactating dairy cows

Abstract

A study to determine the amount and location of water consumption in dairy freestall barns located in northeastern Kansas was conducted during the summer of 2000. Three farms, two Holstein farms with either 2-row or 4-row freestall barns and one Jersey farm with 4-row freestall buildings, were used. Summer water usage averaged 30 to 40 gallons per Holstein cow/day and 20 to 40 gallons/cow/day for Jersey cows depending on age and stage of lactation. The farms with Holstein cows had a water usage ratio of 4 to 4.5 lb of water per lb of milk produced and Jersey cows required 3.1 lb of water per lb of milk production. However, at the Holstein dairies, only about 85% of this water was consumed and the other 15% was utilized to refill the tanks after tipping twice daily to clean cross-overs and water troughs. In addition, 35 to 45% of the water consumed is from a water station in the center crossover of each pen. Cattle also drank the least amount of water from the trough located in the crossover furthest from the pen entrance. When given access to a water trough on the milking parlor exit, cattle consumed 10% (3.5 gallons/cow/day) of the daily water intake at this location. Water usage for drinking increased as milk production increased. Adequate water system capacity and water rights are needed to make allowances for future increases in milk production. Water consumption was greater at the center alleys. Therefore, engineers should consider additional space and/or water troughs at these watering stations.; Dairy Day, 2001, Kansas State University, Manhattan, KS, 2001;

Keywords

Dairy Day, 2001; Kansas Agricultural Experiment Station contribution; no. 02-133-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 881; Dairy; Water consumption; Heat stress; Cow comfort

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DRINKING WATER REQUIREMENTS FOR LACTATING DAIRY COWS

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Summary

A study to determine the amount and location of water consumption in dairy freestall barns located in northeastern Kansas was conducted during the summer of 2000. Three farms, two Holstein farms with either 2-row or 4-row freestall barns and one Jersey farm with 4-row freestall buildings, were used. Summer water usage averaged 30 to 40 gallons per Holstein cow/day and 20 to 40 gallons/cow/day for Jersey cows depending on age and stage of lactation. The farms with Holstein cows had a water usage ratio of 4 to 4.5 lb of water per lb of milk produced and Jersey cows required 3.1 lb of water per lb of milk production. However, at the Holstein dairies, only about 85% of this water was consumed and the other 15% was utilized to refill the tanks after tipping twice daily to clean cross-overs and water troughs. In addition, 35 to 45% of the water consumed is from a water station in the center crossover of each pen. Cattle also drank the least amount of water from the trough located in the crossover furthest from the pen entrance. When given access to a water trough on the milking parlor exit, cattle consumed 10% (3.5 gallons/cow/day) of the daily water intake at this location. Water usage for drinking increased as milk production increased. Adequate water system capacity and water rights are needed to make allowances for future increases in milk production. Water consumption was greater at the center alleys. Therefore, engineers should consider additional space and/or water troughs at these watering stations.

(Key Words: Water Consumption, Heat Stress, Cow Comfort.)

Introduction

Water consumption by dairy cows is related to feed intake, weather conditions, milk production, and stage of lactation. The ratio of drinking water to milk production is estimated at 4.5 to 5 lbs of water per lb of milk. Lactating milk cows drink from 30 to 50 gallons of water/day. Drinking water satisfies 80 to 90% of the daily water requirements of a dairy cow.

The objective of this study was to determine water usage during periods of heat stress and the impact of water trough location in a freestall.

Procedures

Three dairies were selected in north central Kansas for this study during the summer 2000. At the first dairy, Holstein cows were housed in a 4-row freestall barn, milked 2× and milk production averaged 72 lb/cow/day. Each pen contained 84 freestalls with a stocking density of 110%. Figure 1 shows the placement of the water troughs in the 4-row freestall building. Fans and a feedline sprinkler system were used for heat abatement. Walking distance from the back of the milk parlor to the housing area was less than 150 ft. Water space available was 3 cows per linear ft of trough.

At the second dairy, Holstein cows were housed in 2-row freestall buildings, milked

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3× and milk production averaged 78 lb/cow/day. Figure 2 shows the water trough location in the 2-row freestall facility. The milk parlor was a double 12 parlor with two exiting lanes. Water troughs were located on the east and west side of a common exit lane and were equipped with water meters. Cows had to walk 400 to 500 ft from the milking parlor to the freestall buildings. Each freestall had 108 freestalls and was stocked at 100% capacity. Water space available was 3.6 cows per linear ft.

The third dairy utilized Jersey cows producing an average of 65 lb of milk/cow/day. The herd was housed in a 4-row freestall barn and milked 2×. Building layout was similar to Figure 1 except the pens housed cows in different stages of lactation. Each pen housed 40 cows. The walking distance from the milking parlor to the freestall housing area was 30 ft. The water troughs were not emptied on a routine basis for cleaning at this dairy.

Water meters recorded water consumption at each water trough during the summer of 2000. Data were collected from mid June until the end of August. Meters were read approximately every 2 weeks. The water usage data included the amount of water used to refill the water troughs after dumping at the Holstein dairies. It was assumed the troughs were dumped twice a day as the cows were being milked at the two Holstein farms.

The water for all dairies was supplied from deep wells. Each water trough was connected to the main distribution line using a ¾-inch hose. Each water trough held approximately 100 gallons. The water temperature was not recorded during the study period.

Results

Water usage at the first dairy (Figure 3) averaged 35.1 gallons/cow/day including the water used to refill the tanks after dumping. Figure 4 shows the water usage in each of the four pens. Higher producing cattle were located in the SW and NE pens. Over 40%

of the water was consumed from the water trough located in the center cross alley (Figure 5). The water trough located farthest from the travel lane to the milk parlor had the lowest usage. Approximately 4.8 gallons/cow/day were needed to refill the water tanks after tipping. This represented 14% of the total daily usage in the freestall housing area, excluding water used for heat abatement.

Figure 6 shows the daily water usage for the 2-row freestall buildings located on the second dairy. Data from the north pen more accurately reflected the water usage of this herd at 40.2 gallons/cow/day plus an additional 3.5 gallons/cow/day at the milk parlor water tank. Data from the south pen shows the impact of a leaking water line (Figure 7). Average water usage per cow increased from 40.2 to 58.9 gallons/cow/day. This represented nearly a 50% increase in water consumption during the study period. Figure 7 shows the water usage at the individual water troughs in the north and south buildings. The water meter reveals the impact of the leaking water line at the water trough farthest from the travel lane in the south building. Water usage at the center water trough and water trough near the travel lane were similar. Approximately 6.7 gallons/cow/day were used in refilling the tanks after tipping. This represented 15% of the total daily water usage in the housing area.

Figure 8 shows the water usage at the water troughs located in the milk parlor exit lanes at the second Holstein farm. There was no difference between the usages of water in the west or east exit parlor lane. The total water usage at the exit lane was approximately 3.5 gallons/cow/day or about 8% of their daily consumption.

The third site showed that Jersey cows required significantly less water. Data collected during the summer of 2000 found late lactation cows, early-lactation cows and 2-year-old heifers drank 20, 24.5, and 21.4 gallons/cow/day, respectively. Because the tanks were not routinely tipped for cleaning, this was more representative of the actual water consumed by the cows.

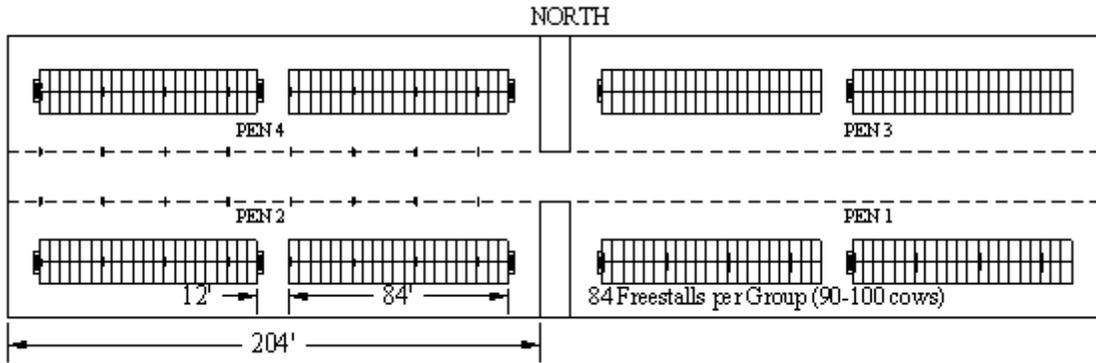
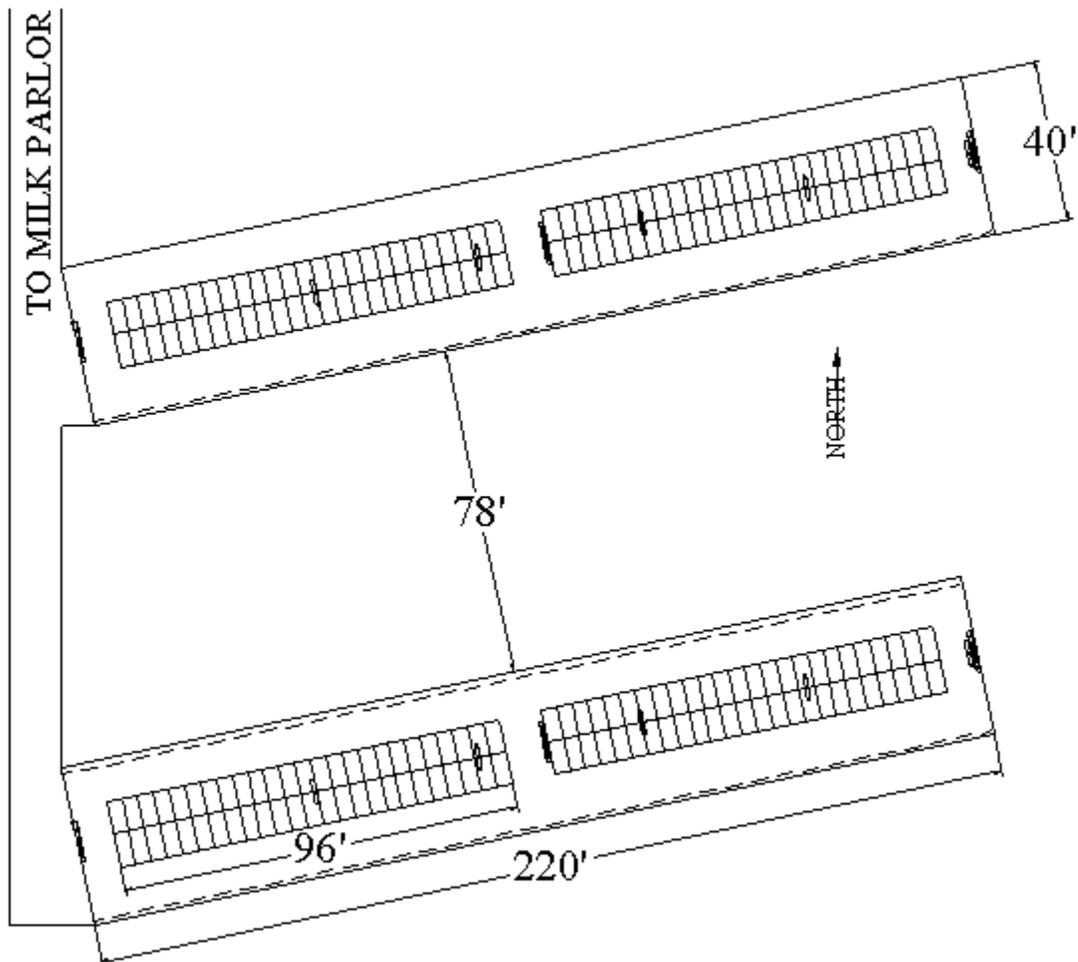


Figure 1. Layout of Pens and Location of Water Troughs ☒ in a 4-Row Freestall Building.

Figure 2. Layout of 2-Row Freestall Buildings and Location of Water Troughs ☒.



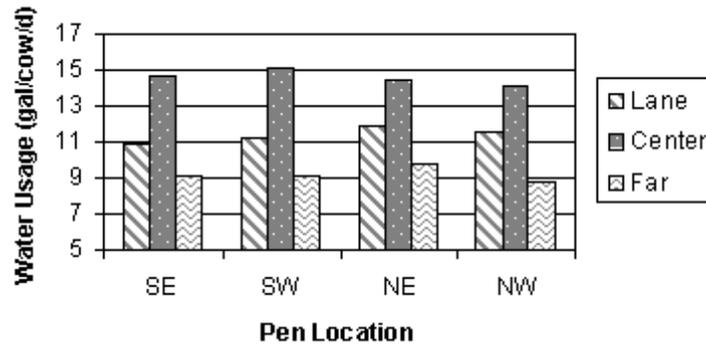


Figure 3. Total Daily Water Disappearance from Water Troughs in Different Pens in a 4-Row Freestall Building Populated with Holstein Cows.

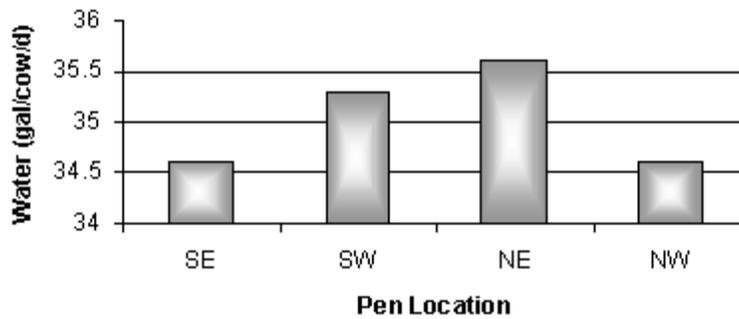


Figure 4. Water Disappearance from Water Troughs Located in Different Sections of a 4-Row Freestall Building Populated with Holstein Cows.

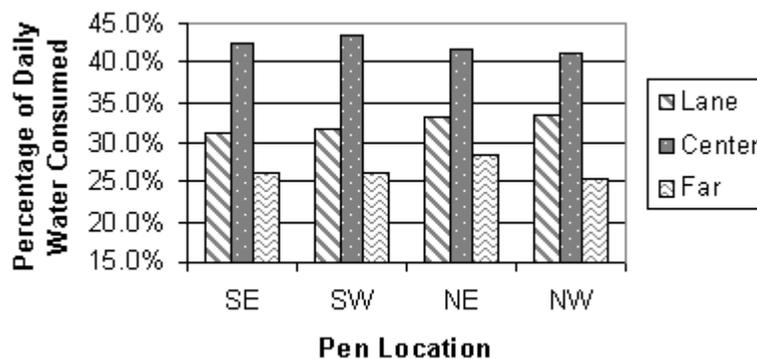


Figure 5. Percent Water Disappearance from Water Troughs Located in Different Sections of a 4-Row Freestall Building Populated with Holstein Cows.

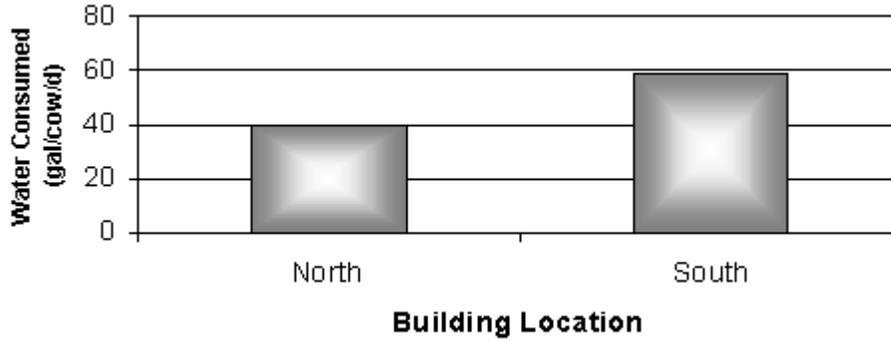


Figure 6. Total Daily Water Disappearance in 2-Row Freestall Buildings Populated with Holstein Cows.

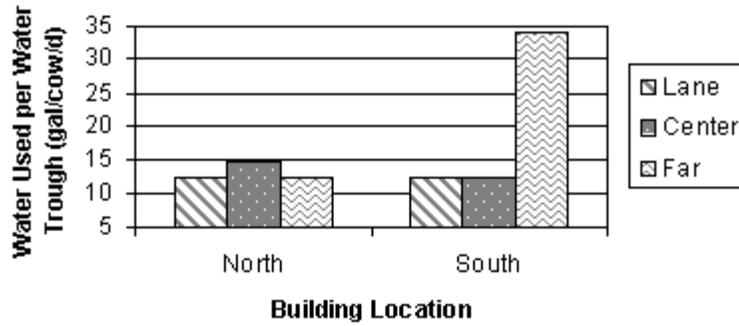


Figure 7. Water Disappearance from Water Troughs Located in Different Sections of a 2-Row Freestall Building Populated with Holstein Cows.

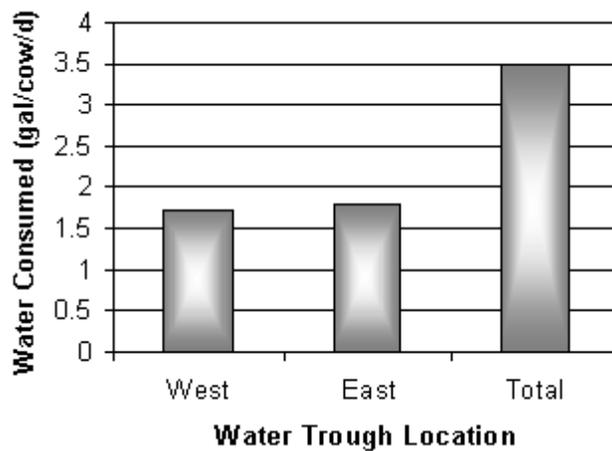


Figure 8. Water Consumed by Holstein Cows at Water Troughs Located at Milk Parlor Exit.