Cooling cows in Ozlem dairy farm, Turkey

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Cooling means to reduce heat stress from cows have been developed over the last four decades in Israel, and are applied to a different degree of success in many farms in the world.

Cooling cows in the farm is based largely on the daily routine, which includes cooling the cows in the waiting yards, before and between milking sessions, as well as in the feeding line, around feeding time. Cows are usually forced ventilated in resting area, if it is in free stalls or compost barns.

In spring 2016 I was invited by the Ozlem dairy farm management, to consult them in mitigating heat stress from the cows. This was due to the fact that the farm suffered large drops in milk production and fertility during summer months. Ozlem farm is located in the south Mediterranean coast of Turkey, near the town of Izmir, with 4 month per year (June – September), where cows are exposed to heat stress conditions in most or all hours of the day.

The Ozlem dairy farm consist of approximately 1,000 Holstein cows, housed in two free stall barns and milked 3 times a day, with a total of 14 hours a day, in two De Laval milking parlors. Until summer 2015, before we started our “cooling project”, the cows were cooled in the two waiting yards 12 m’ wide and 15 m’ long, with 2 lines of De Laval fans (DL 1250) in each waiting yard and 4 fans per line. Wetting was provided by low pressure foggers located above fans. Cooling was applied 3 times a day only when the cows came for milking. Cooling in feed line was provided by fans installed along the feed line 18 m’ apart, 3 m’ above surface. Pipelines were installed just below fans and low pressure foggers were installed. The system worked 24 hours on very hot days but it worked normally from 07:00 to 20:00, providing 1 minute fogging in 4 minutes. Cooling was applied only 3 times a day, for 45 minutes after milking.

In preparation to cooling the cows in summer 2016, 3 lines of fans were installed in each waiting yard, 5 fans (DL 1250) per line, 3 m’ above yard surface. Fogging system was replaced by 300 lit/h sprinklers, installed 2 m’ apart 2.8 m’ above yard surface. Fans operated by timer for 45 seconds every 4 minutes before each cooling session. Number of fans (DL 1250), was doubled in feed line and installed, 9 m’ apart along all feed lines of one barn, and wetting was given by replacing the fogging system by 300 lit/hour sprinklers, set to operate for 45 seconds every 4 minutes. Cooling in feed line in second barn remained as before in summer 2016 and was modified to operate as in the first barn feed line, in summer 2017, where system finally operated completely and as initially recommended. The complete cooling in summer 2017 consisted of cooling the cows in waiting yard, before each milking session and when cows left the waiting yard (after being milked), for additional 45 minutes in the feed line, while being locked. Each group was cooled again, for 45 minutes, in the waiting yard, 4 hours after being milked and cooled. In total, cows were cooled for more than 6 cumulative hours per day, 6 times in waiting yard, followed by cooling when locked, in the feed line.
Cow's body temperature was monitored continually along all summer 2017, by using intra vaginal data loggers and showed that cooling treatment "worked well", and that the cows were maintained in thermal comfort (below 39.0 °C), almost 24 hours a day, as can be seen in figure 1, where the average of 10 high yielding cows in a typical summer day was measured.

Figure 1 - Average vaginal temperature measured in 10 milking cows in 10 minutes interval along the 24 hours of a typical summer day.

Average per cow milk production in Ozlem farm was increased significantly in summer 2017, as compared to summer 2016, when only half of the cows being cooled properly, and summers 2014 and 2015, when cows where almost without any effective cooling (Figure 2, for daily average milk production and figure 3, for daily peak lactation).

Figure 2 – Average daily milk production per cow (lit/day), in 2014-2017.

Figure 3 – Average peak daily milk production (lit/day), in adult cows in 2014-2017.
Annual Milk production per cow in Ozlem farm increased between 2014 and 2017, in 1580 liters (annual increase from 9,000 to 10,580 liters per cow, an increase of 17%). Assuming that only part of this increase can be related to the improvement in cow cooling, we can consider a 1,000 liters increase in annual production per cow due to the intensive cooling in summer (increase of 10%). According to previous studies, we can assume that, the increase of 10% in annual production and the intensive cooling provided to the cows, improves by at least 5%, the feed efficiency (feed conversion to milk) for the 120 summer days.

Intensive cooling the cows in summer 2017 improved significantly also cow’s fertility. Conception rate of cows inseminated in summer month in 2017, was almost double of that obtained in same months of 2014 and 2015, as can be seen in figure 4.

Figure 4 – Conception rate from all insemination given to all the cows in 2014-2017.

We assume that, the increase in conception rate have the potential to reduce “open days” by at least 5 days per cow, with a value of at least of at least 25 USD per cow/year.
Based on the real results obtained, I conducted an economical study, in order to evaluate the cost effectiveness of the implementation of intensive cooling in Ozlem farm. The study was carried out by making use of a special computer program which I developed recently. The study included an increase of 10% in annual production per cow, a 5% improvement in feed efficiency for the months June - September (120 days), and a reduction of 5 "open days" in calving interval, with the value of 5 USD per day (total benefit of 25 USD per cow/year). The investment for the installation of additional cooling equipment, according recommendations was of 140,000 USD for cooling equipment (140 USD per cow) done in 2 years (data provided by the farm manager). Farm gate milk price was of 0.37 USD and the price of 1 kg DM feed mix for milking cows was of 0.28 USD. An increase of 0.5 kg DM mix in feed consumption was calculated for every additional liter of milk produced due to cooling. The cost of operating the cooling system in the summer was 30 USD per cow/year.

Based on the data presented above, the net income per cow, due to intensively cooling the cows in summer 2017 was of 200 USD per cow, and 200,000 USD per farm. This means that payback of investment was in less than one year.

Pictures

Fans (DL 1250) installed along the feeding line, 9 meters apart for half of the cows in summer 2016 and all the cows in summer 2017 in waiting yard in summers 2016 and 2017.

Picture 2

Picture 4 – Cows resting outside in the shade.