REAL SCIENCE
Lecture Series

Webinar Summary
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Managing Dairy Cows in an Extreme Warm Environment – An Israeli's Perspective

Dr. Israel Flamenbaum

Cooling cows is considered an essential practice to improve cow performance and health. This becomes even more important in an extremely hot climate, such as Israel. Dr. Flamenbaum started his presentation presenting the highly variable climatic conditions in Israel. Even though the country is small, the climate can vary considerably, starting from the area close to the Mediterranean sea which is extremely hot and humid in summer; passing through the mountains reaching 3000 feet; finally reaching the Jordan Valley, 1200/1500 feet below sea level with temperatures averaging almost 120°F/50°C in summer. Trying to transfer these climatic conditions to dairy farming reality, Dr. Flamenbaum mentioned that on average the percentage of hours for the whole year where THI is over 70 is 45%, with a minimum of 35% to a maximum of 60% depending on the location. The dairy industry in Israel represents over 130,000 Holstein cows, distributed on 800 farms across the whole country, with an average production of 27,100 lbs/12,300 kg per cow per year.

The short and long term effects of cooling cows

Improving feed efficiency is the main economic factor influencing dairy farm profitability, when mitigating heat stress in dairy cows. Cooling cows can influence feed efficiency in the short term, increasing the ability of cows to convert DMI in milk of 15% passing from 90°F to 72°F. At the same time, average Israeli milk production has been increased by application of specific cooling strategies, giving a further 10% increase in feed conversion rate over the past years.

Cooling cows in Israel

There are multiple means to mitigate heat stress:

- Shades
- Direct cooling (wetting, forced ventilation, combination of both)
- Indirect cooling (Tunnel ventilation, Tunnel and Cross ventilation)

In Israel, shades and a combination of wetting and forced ventilation has been developed as the best approach to mitigate heat stress, balancing costs and benefits in cows.

Sites of cooling:

- Holding pens (before and between milking sessions)
- Special cooling yards (between milking sessions, mostly in large scale farms)
- Feeding line
- Resting area (only using forced ventilation)

Frequency is crucial as well, aiming to achieve a positive outcome of a cooling strategy and has to vary depending on the average milk production of the cows. Aiming to maintain a body temperature below 102°F, cows producing 55 lbs of milk can be cooled every 6 hours, while cows producing 100 lbs of milk need to be cooled every 3 hours.

Common cooling protocol in Israeli dairy farms

1. Forced ventilation (wind speed of 3 meters/sec)
2. Cycles of 30/60 seconds wetting every 5 minutes, with continuous forced ventilation
3. Cooling sessions of 45/60 minutes each
4. Six cumulative hours of cooling time per day
5. Cooling provided every 4 hours
6. Dry cows are cooled with 4-6 sessions of 30 minutes each

Evaluating the effectiveness of cooling treatments in the long term

The ability to employ a metric to measure heat stress and evaluate abatement strategies may benefit dairy producers by providing meaningful feedback of the effectiveness of current and future management strategies with the goal of improving heat stress management. Aiming to fill this gap, Dr. Flamenbaum, in cooperation with the Extension Service of the Ministry of Agriculture and Israel Cattle Breeders Association, has developed a metric called the **summer to winter ratio (S:W ratio)**. This ratio is able to evaluate the seasonal effects of heat stress on performance of individual cows and thus the real value of any managerial approach to heat stress. Summer (Jul – Sept) performance variables are compared with winter (Jan – Mar) performance variables, and the closer the ratio is to 1, the less effect heat stress is having on the variable of interest. Based on this data every single farm in Israel is classified yearly and the ones successful or failing in cooling efficiently the cows can be identified.

Parameter / Type of farm	"Successful" Farms	Average Cooperative Farms	"Failing" Farms
Winter milk production (kg/cow/day)	39.8	38.3	39.4
Summer milk production (kg/cow/day)	39.4	36.4	34.7
Summer : Winter ratio (Milk)	0.99	0.95	0.88
Conception Rate in Winter (%)	44.4%	42.7%	42.9%
Conception Rate in Summer (%)	33.8%	20.0%	14.3%
Difference in CR W-S, in percentage units	-11	-23	-29
Farms	10	162	10

Based on these results, it has been clearly shown that farms with a S:W ratio close to 1 lose much less milk during the heat of the summer. The continuous observation during the last 12 years has shown that “successful” farms improved their average yearly milk production by 8.3% (starting at 26,675 lbs/cow and improving to 28,800 lbs/cow), while the “failing” farms improved annual milk yield by 6.5% (starting at 24,245 lbs/cow and improving to 26,014 lbs/cow). The S:W ratio was used by Guinn et al. (JDS, 2019) to evaluate differences between Northern US and Southern US farms in managing heat stress.

Zeelim Dairy farm case study

Farm description:

- Located in the south of Israel in the desert
- 350 Holstein cows
- 3X milking
- Milk yield/lactation/cow: (32,500 lb)
- Milk fat: 3.85%
- Milk protein: 3.45%
- SCC: 180,000

Summer management:

» Walkways shaded
» Water space per cow > 12" (barns + walkways + cooling area)
» Cooling yard space: 2 m^2/cow
» Feed distribution 3X/day and pushed every hour, 24/7
» Cows cooled in the holding area before each milking for a total of 3 hr and in the cooling yard for the other three sessions of 1 hr each.
» Feed lines are equipped with fans and misters operating through detecting sensors

Results:

	"Zeelim" Farm	All Cooperative Farms (162)
Average summer milk (lbs/cow/d)	107.7	84.4
S:W Milk ratio	0.99	0.94
S:W Peak lactation ratio	0.98	0.94
S:W SCC (000)	0.80	1.13
Conc. Rate Winter (%)	37%	36%
Conc. Rate Summer (%)	34%	21%

The cost-effectiveness of investing in cooling

Dr. Flamenbaum shared a spreadsheet able to evaluate and balance the potential return of investing in a cooling system for a 500 dairy cow farm in Israel. Based on actual cost of the initial investment and a potential benefit in terms of milk production and feed efficiency of 5%, the overall expected return per cow/year is $160, meaning $80,124 for the whole herd.

Take-Home messages

» Proper installation and operation of cooling systems can mitigate summer declines in milk and cow fertility
» These results can be achieved in extremely warm climates with high producing cows
» Investing in cow cooling is one of the most profitable investments on a dairy, but it must be done properly

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