

"Summer to Winter Ratio" - A tool for evaluation of the effectiveness of farm's heat abatement treatments

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Summer conditions make the implementation of cooling systems in the dairy farms an important tool for efficient milk production. In cooperation with the "Israeli Herd book" data, a new index was developed, called the summer: winter ratio. This index serves as an indicator for characterization of the effectiveness of farmer's efforts to reduce summer negative impact on cow's performance. In the following article, the use of this index will be described, and the achievements of the Israeli dairy sector in combating heat stress in the last 15 years will be presented.

Increasing summer milk yield and fertility and reducing seasonality in milk supply to the dairy industry are among the main goals of dairy sectors in hot regions. In the last three decades, intensive cooling systems and summer management practices were developed and largely introduced to the dairy farms in these countries, among them, Israel. Extension services of the Israeli ministry of agriculture and the Israel Cattle Breeders Association (ICBA) cooperated to develop a computerized index, based on the Israeli "Herd book" data, to evaluate the effectiveness of cooling cows in the summer.

The "summer: winter ratio" is calculated, based on the monthly milk recording data, creating a "virtual production curve" for summer and winter, for all cows in each dairy herd. The S:W ratio report is an "Excel" which compares Summer (Jul-Sep) to Winter (Jan- Mar) corrected averages for daily milk production, milk fat, protein and SCC contents, as well as conception rates. The S:W ratio report:

- Analyzes each dairy farm results once annually.
- Compares each farm to its "relative group" (sorted by region and production level).
- Compares each farm to its data in previous 4 years.

S:W ratio allows each farmer to evaluate the effectiveness of his efforts to combat heat stress in his farm, but also serves farmers organizations, government organizations and the dairy companies, for decisions and policy making. A S:W ratio close or above 1.0, means that the tested dairy farm is dealing properly with summer heat stress. The lower this ratio is, more efforts need to be made to improve cow cooling effectiveness in this farm. In a study carried out in Israel, intensive cooling effect was studied, comparing summer and winter per cow milk production. The study involved 5 large scale dairy farms intensively cooling their cows in the summer (7.5 cumulative hours of wetting and forced ventilation per day before and between milking time), and 5 farms who lightly cooled the cows in summer (wetting and forced ventilation only before milking time (1). Results are described in table 1.

Table 1 – Average summer and winter daily milk production (kg) in dairy farms intensively and lightly cooling the cows in summer.

Season / Treatment	Lightly cooling	Intensively cooling
Summer	35.0	40.0
Winter	38.9	40.5
Difference (kg)	3.6	0.6
Summer to Winter ratio	0.89	0.98

When analyzing the data of this study, we discovered that calculating the production ratio between seasons (S:W ratio) can be a good indicator of farm's effectiveness of heat stress abatement through cooling the cows.

In another survey carried out later on, the S:W milk production ratio was calculated for 180 large scale, cooperative dairy farms, and 432 family, small scale dairy farms, with annual milk production averaging above 11,500 kg/cow (2). The distribution of farms with high medium and low S:W ratio is presented in table 2.

Table 2 – Distribution (%) of farm with high medium and low S:W milk production ration in the Israeli herd.

Summer : Winter milk ratio	Herds	%
< 0.90	209	34%
0.91 – 0.95	269	44%
> 0.95	134	22%

From the data presented in table 2 we can learn that, still, only one quarter of the dairy herds in Israel reach "reasonable" results it what refers to properly dealing with summer negative impact on the cows and that still, much work need to be done to achieve better results.

Is it possible? The answer is in the following table, describing the evolution of S:W ration in the large scale cooperative farms in Israel, who are known to accept new technologies more easily and more intensively cool their cows in the summer. The evolution of S:W ratio was first calculated for the 180 cooperative dairy farms in the period between 1994 and 2004 (3) and later on, 2008 data was added and presented in table 3.

Table 3 – S:W ratio in 180 large scale cooperative dairy farms in Israel in 1994, 2004 and 2008 and the differences in S:W ratio between years.

Year /Season	winter	summer	S:W ratio
1994	37.7	31.0	0.82
2004	39.8	36.5	0.92
2007	40.0	38.3	0.96
Difference 2008 – 1994 (kg)	+ 2.3	+ 7.3	-
Difference 2008 – 1994 (%)	+ 6%	+ 23%	-

From the presented in table 3 we can see that the S:W milk ratio index can be a good indicator for describing the improvement in summer performance of the cows, reached through successful adoption of recommended cooling methods.

The S:W ratio index served us also when quantifying the expected increase in annual milk production due to cooling and better managing the cows in the summer, assuming that better ratio means better cow management in summer. The annual milk, economical corrected milk (ECM), fat and protein %, were compared between top and bottom 25 herds in the Israeli dairy sector, sorted by ECM S:W ratio. The results of this study are presented in table 4.

Table 4 – 305 days milk (kg), economical corrected milk (ECM) (kg), milk fat and milk protein (kg) in top and bottom S:W ratio farms in Israel.

	Low S : W ratio	High S : W ratio	Difference (kg)	Increase (%)
Milk (kg)	11,350	12,000	650	6.0%
ECM (kg)	11,080	11,800	720	6.5%
Milk fat (kg)	400	430	30	6.8%
Milk protein (kg)	360	385	25	6.8%

From the presented in table 4, we can learn that, under Israeli conditions, better managing the cows in summer, and especially intensively and properly cooling them in the hot season can increase cows' annual production by 6 - 7%. I can guess that in high yielding dairy sectors, in regions with longer and more extreme summers (South USA, Middle East, Central America, South China and S.E Asia), the productive benefits from cooling cows in summer can be much greater.

In conclusion – this article presents how the S:W ratio index can be used as a tool to evaluate farm's capabilities to combat summer heat stress and reduce summers negative impact of cows performance.

References:

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