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The Key to Successful Dairy Cattle: Days in Milk (DIM)

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ABSTRACT

In this study, the important term of "Days in Milk (DIM)", this is equivalent meaning in Turkish terms like "Sağımda Geçen Gün (SGG)" was emphasized in terms of dairy cattle. In this scope, it was expressed that averaged days in milk ($\overline{DIM}$) should be 160-170 days in well-managed herds. However, it is emphasized that this value is about 250 days at some dairy cattle breeder's conditions in Turkey and is in an undesirable level. It is expressed that it corresponds to a calving interval of about 1.5 years in Turkey dairy cattle breeders and that it corresponds to a calving interval of about 1.5 years in Turkey dairy cattle breeders and that milk yields of farms is below what it should be too.

1. Introduction

Turkey's cattle population is about 14 million heads and approximately one third of these cattle are being milked (% 38.6). In addition, about 16.8 million tons of milk are produced from these cattle (TUİK, 2017). There have been being serious problems with reproduction in imported heifers until now. The problem of reproduction is one of the most definitive proofs that the environmental requirements for imported animals are not met. In this case, it is necessary to give importance to the herd management with the awareness of the work is a commercial activity and the breeds of culture and its crossbred's animals conditions should be satisfied.

Herd management is consist of; (1) control of estrus of animals, (2) insemination and success of insemination, (3) ensuring of pregnancy, (4) birth, (5) protection of living and the dam's health by obtaining healthy calf, (6) closed average milk production (7) the storage of milk, (8) the control of animal health, (9) selection, (10) to delivers the up to the calf yield era and the establishment of economically productive period of life, (11) no problem lactation in calving cows and ensuring timely new pregnancy, (12) feed and forage production supply, (13) safety of workers, (14) manure management (15) and marketing.

In this study, it is especially aimed to explain that it is possible to benefit from a single parameter about the reproductive status and the profitability of milk production in dairy farms. This parameter is generally discussed and abbreviated in the foreign literature as "days in milk" and "DIM". In Turkish "days in milk" described as "sağımda geçen gün sayısı", and abbreviated as SGG in page report is given at the bottom of some herd management program. As follow, the title of average days in milk ($\overline{DIM}$) will be discussed in detail. For example, by reducing average DIM ($\overline{DIM}$) from 250 days to 200 days, how and how much daily milk yield and reproductive performance per animal is increased or can be achieved will be tried to be explained. By benefit from the parameters discussed in the study, it will be explained that the contributed current level of milk yield at the country level and the increase in calf yield can be achieved by up to 50%. It is try to demonstrate that efforts can be made to approach these parameters optimally instead of importing, and that more milk can be produced without entering the herd management regime without having to do more with the existing animals than with the number of imported animals.

2. Average of Days in Milk ($\overline{DIM}$)

DIM (days in milk) or the corresponding Turkish "sağımda geçen gün (SGG)" is one of the most important herd management criteria. Individually, DIM, indicates that only an animal milked the count of the number of days or on the day of lactation. However, the average herd DIM shows the average number of days in milking herd. In other words, it shows how much the average milking of animals in a year.

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For example, number of lactated cows are 1000 in a farm, in which milking this day (control day), if it is determined that the animal is on the day of lactation and the average is taken. This value is called "average number of days on milking". Any day is a good day dispersed into managed herd in 365 years of birth (test day) must be average DIM of 150-160 days. Test day on the first day DIM who started to milking, the first on day 5, which in 55 days, while those in 155 days, 255 in which the end ones and finally lactation in the day (300-310 days milking animals) that will be dry control day is expected to be allowed. Considering first a simple calculation control day and dry the animals on the first day when milking (1+305) / 2 is expected to be an average of 153 days. Other animals in the herd exhibit a range from 1 to 305 in lactation. So one so close to the animals if there is close to 305 animals that much collection should be around average as most of the animals will be the trend. In this content, if it is determined that the control day of lactation of all animals to which day and is expected to be a value near the average number of days, the average DIM is expected to be around 150-160 days. It is well managed herd that averages close to this value, it is also an indication that it is a profitable business. The value of the management concluded that worsened in the value away is reached. Also, this value is well below the 150 day is an indication that the herd consists of starting animal lactation. Sometimes it can be had with a DIM of 150 or 160 days, first question to ask them that what is number of lactation. These values do not explain the statues of herd management that is the newly established herd. Also another a reason could be made estrus synchronization.

Moving the monthly summary of the herd, 12-monthly average DIM must be 160-170 days. It can be said that in addition to those explained above, the test day is any day of the 365 days of the year. That is an average of 365 days.

If the DIM value of 200 instead of 150, existing to problems associated with reproduction (unsuccessful pregnancy), which indicates the presence of too much prolonged or late lactation animals should be the duration of lactation. Still milking a late lactation cows lead to reduced daily average milk yield (Figure 1). In addition, DIM will vary from month to month as a result of irregular calving or breeding problems could occur.

Births is normally distributed in the year, in any day average milk yield, that can be considered as an estimate of the year (365 days) average. The annual production of 365 multiplied by the average/cow can be found approximately. The estimated annual loss of milk yield; (1) For example, if accepted DIM 250 days and optimum DIM 150 days, deviation is 100 cows/day, (2), which has an average deviation per animal, (3) Accepted 250 DIM milk yield of 20 kg, 150 DIM in the 27 kg, 7 kg for 100 days/cow/day there is loss, (4) assuming that there are 1000 dairy cattle

herds, these 7 x 1000 x 365 = 2,555,000 kg milk / year are lost (5) another fact 100 DIM deviation is a deviation per cow, 1000 x 100 = 100 000 days lost/year are, (6) 100000/365 day (calving interval) = 274 calves / year are lost, (7) 274 calves / year say that means the loss of 274 lactation. Although this situation is not possible physiologically, such a calculation has been made to draw attention to the time lost. Normal lactation curve and in relation to dry matter intake during lactation Figure 1 is arranged.
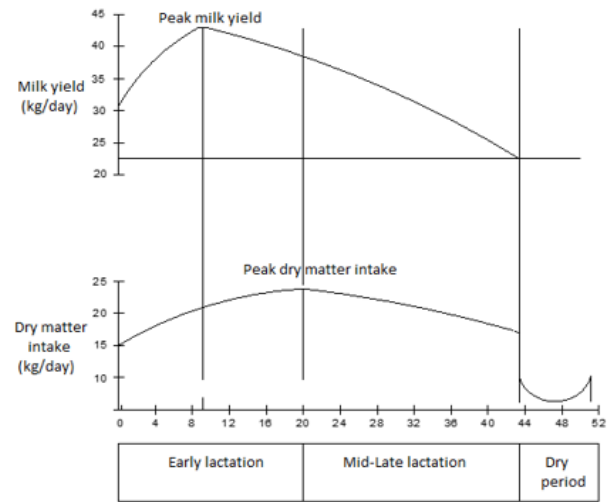

Figure 1

Milk yield and dry matter consumption distribution throughout lactation (modified from Yavuz, 2017)

Figure 1 indicated the peak of milk production in 8-9 weeks of lactation. Since the decline in milk yield at 9 weeks, the dry matter intake increase until week 20th. Next time, milk production has also decreased dry matter intake with a tendency to decrease. Accordingly, if there is DIM 150 days versus 200 days (i.e. 20 weeks compared to 30 weeks) to be a higher dry matter intake for milk production, the cost of milk production increases. This situation can be seen from Figure 2.

Having a high average value of DIM means that a lot of cows cannot be sufficiently evaluated. As previously mentioned, an evaluated of milking cows in late lactation herd leads to reduction of the daily average milk yield (Figures 2, 3 and 4).
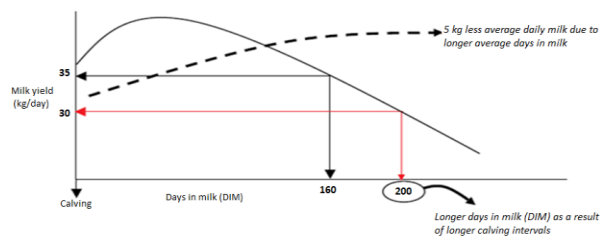

Figure 2

The effect of prolonged DIM on milk yield and calving interval (Ahmadzadeh and Heersch 2011; Ahmadzadeh, 2017)

As it can be seen from Figure 2, deviation of 40 days of DIM from 160 days DIM (200-160), 5 kg / cow / day of (35-30 kg) which means a loss of milk production. Moreover, the missed estrus or problem of pregnancy are caused prolonged calving interval related elongation of DIM.
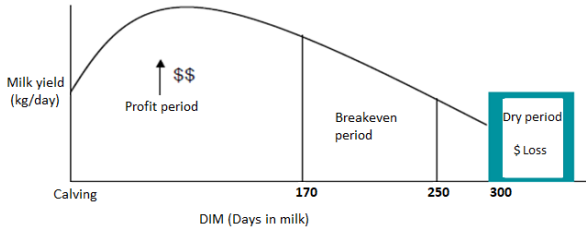

Figure 3

The effect of DIM periods on profitability (Ahmadzadeh and Heersch 2011; Ahmadzadeh, 2017)

Figure 3 illustrate the profitability is up to 170 days in a well-managed herd, but in the next about 80 days, it is seen that the breakeven period. Loss period is starting after 250 days DIM and then it is understood that since the animals did not give milk after the 300th days DIM because not yield any. In fact, fetal growth is faster than in the period from 300 DIM appears to be inefficient and is preparing for the next lactation animals. This aspect can be considered as a kind of dry fallow (it is called "nadas" in Turkish meaning; rest and renewal) period.
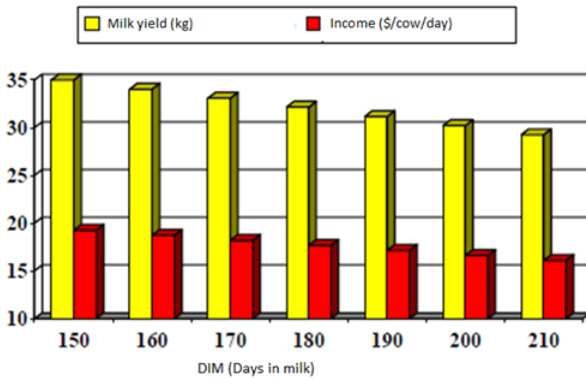

Figure 3

The relationship milk yield and days in milk (Woodley, 2003)

Woodley (2003) presented the decline in milk yield with the progress of the day and accordingly the current decrease in income by the barred diagram. At 150 DIM, milk yield of 35 kg / cow / day and income near $ 20 / cow / day have fallen into milk yield of 30 kg / cow / day and income near $ 15 / cow / day at 200 DIM.

It is necessary to calculate DIM for each month and to find the annual average DIM later. It is not appropriate to assess the reproduction status of herd from the average DIM per month, therefore the annual average

DIM must be calculated, and then this value should be interpreted accordingly the proximity of the target value. It should be careful if there are seasonal calvings. Because of these, the average DIM can reduce and lead to misinterpretations. For examples, sometimes it can be seen that DIM 275 decreased to 100. Table 1 shows how much milk is lost per cow per day over average DIM 150 days in the herd.

Table 1

How much milk is lost per cow per day over average DIM 150 days in the herd (Grusenmeyer et al., 1983 from Hamilton, 1971)

Herd milk yield level (kg)	loss/cow/day (kg)
7264 <	0.08
7264 >	0.06

A herd with 7 750 kg of the average milk yield and190 days of a average DIM produces 3.0-3.5 kg less milk per cow than a similar milk yield herd that had the average 150 DIM days.

190 - 150 = 40 days (DIM deviation)

40 x 0.08 = 3.2 kg / cow / day

If the average daily milk yield of cows in this herd is 25 kg (7750/305), the DIM's approximation to 150 days will bring the average daily milk to 28 kg.

Some herd managers are talking about culling undesirable animals from their herd to lower the average of DIM. This is nothing more than a postponement of the problem. Herd management previous views about the deficiencies will be repeated after a while, if not resolved.

Young (2002) stated that a relative increase of the average DIM value (e.g., over 200 days) is primarily due to reproductive disorders. High average DIM affects milk production negatively. Because as the DIM increases, the percentage of late lactating cows increases. When lactation is prolonged, milk yield decreases. When lactation period is prolonged, milk yield decreases. It is assumed that the service period is 85 days for all of the following calculations.

Calculating of the average calving interval is given in Table 2.

In the calculations below, the optimum DIM and a year are taken as 160 days and 365 days, respectively and annual average DIM from calving interval can be calculated by the following calculation.

Calving Interval (days) x average DIM (day)) / 365 (days)

Similarly, calculation of calving interval from annual average DIM;

Average DIM (days) x 365 (days) / optimum average DIM (days)

Table 2

Calculation of average DIM from average calving interval and calculated calving interval from average DIM

Calving Interval (CI) (day)	Annual $\overline{DIM}$ (day)	Calculation of Calving Interval from $\overline{DIM}$	Practical Calculation of Calving Interval from $\overline{DIM}$
460	(460 x 160) /365 ~202	(202 x 365) / 160 ~460	202 x 2.28[*] ~ 460
440	(440 x 160)/ 365~ 193	(193 x 365) / 160 ~ 440	193 x 2.28 ~ 440
420	(420 x 160)/ 365~ 184	(184 x 365) /160 ~ 420	184 x 2.28 ~ 420
400	(400 x 160)/ 365~ 175	(175 x 365) /160 ~ 400	175 x 2.28 ~ 400
380	(380 x 160)/ 365~ 167	(167 x 365) / 160 ~ 380	167 x 2.28 ~ 380
365	(365 x 160)/ 365~ 160	(160 x 365) / 160 ~ 365	160 x 2.28 ~ 365

Calculating estimated number of escaped estrous from annual average DIM and number of escaped estrous from calving interval are given below.

In the calculating estimated number of escaped estrous from annual average DIM, it can be found how many normal days one optimum DIM coincides by using the below calculation.

If 160 day optimum $\overline{DIM}$ 365 days,

    1 $\overline{DIM}$ day   x days?

Hence, x = (365 x 1) / 160 = 2.28125 days.

It will be explained more clearly that the optimum $\overline{DIM}$ is removed from the herd $^{-}$DIM, and this is converted to the normal time as day, and then the number of missed estrus is estimated by dividing this value the average estrous cycle (21 days). These calculations are shown in Table 3.

Table 3

Estimate of the number of missed estrus from average DIM or calving interval[*]

Annual $\overline{DIM}$ (day)	Estimated number of escaped estrous from Annual $\overline{DIM}$ (number)	Calving Interval (day)	Number of Escaped Estrous from Calving Interval (number)
202	((202-160) x 2.28) / 21 = 4.5	460	(460 - 365) / 21 = 4.5
193	((193-160) x 2.28) / 21 = 3.6	440	(440 - 365) / 21 = 3.6
184	((184-160) x 2.28) / 21 = 2.6	420	(420 - 365) / 21 = 2.6
175	((175-160) x 2.28) / 21 = 1.7	400	(400 - 365) / 21 = 1.7
167	((167-160) x 2.28) / 21 = 0.7	380	(380 - 365) / 21 = 0.7
160	((160-160) x 2.28) / 21 = 0.0	365	(365 - 365) / 21 = 0.0

[*]It is assumed that the service period is 85 days.

3. Results

As a result, it is possible to obtain information on both of these parameters and the milk production status on the basis of the test day average ($\overline{DIM}$) instead of calculating the herd management parameters such as service period, number of insemination per pregnancy and the like. Briefly, DIM give a result that will reflect the other parameters such as reproduction and milk production parameters about herd management by itself.

4. Statement of Conflict of Interest

Authors have declared no conflict of interest and contributed to this work equally and also this study presented in 4th International Conference and Industrial Exhibition on Dairy Science Park, November 1-5, 2017 Konya, Turkey.

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