Extra Production – at What Cost?

Oded Nir (Markusfeld)

Dairy Herd Health Consultant to Hachaklait & S.A.E. Afikim, Israel

In the recent year, the industry by enlarge is trying to increase production, why and under what conditions?

- ❑ There is a global shortage of milk – quota systems are broken
- ❑ The best alternative for most herds is to produce more all around the year
- ❑ The immediate available ways to produce more are:
  - o To increase the number of cows (when the size of the herd is not limited by "methane regulations") – through reducing selection, lowering the marginal economy corrected milk **(ECM)** threshold for culling, and keeping all the heifers.
  - o Production “tricks” – increasing the number of daily milkings, delaying drying off, and increasing hours of light
- ❑ The temporary situation prevents investments in new housing
- ❑ Feed costs are rapidly increasing, the income from milk is lagging behind
- ❑ Use of BST is prohibited in EU and some other countries

The dilemma for the farmer – are all the ways for extra production really profitable?

The present paper examines the various options available to farmers to increase production and maximize profit.

Taking Care of Diseases and managemental mistakes

Identification of factors which adversely affect production and correcting them will enhance production through improvement of the lactation curves. Table 1 is an example for a potential annual "return" of 81,556 liters of milk to Herd #1 by reducing loss of production associated with postparturient uterine diseases.

Table 1. Expected annual return of milk (liters/herd) by reducing the adverse effects of postparturient uterine diseases (**PPUD**) on milk yield

Lactation	**First**		**Second**		**≥Third**		**Expected Return of milk liters/year /herd**
Extended 305-days milk	10,180		12,656		13,209		
Total	**n with PPUD**	129	**n with PPUD**	135	**n with PPUD**	193	
PPUD	63	-235	55		108	-639	81,556

PPUD = retained placenta and primary metritis

By such **causal analysis's** it is possible to "return" to herd #1 by correcting all the mistakes evaluated a total (maximum) of **414,286** liters per year, which equals to **7.4%** of its annual quota.

Stocking density, mean days in milk (DIM) and somatic cell counts (SCC)

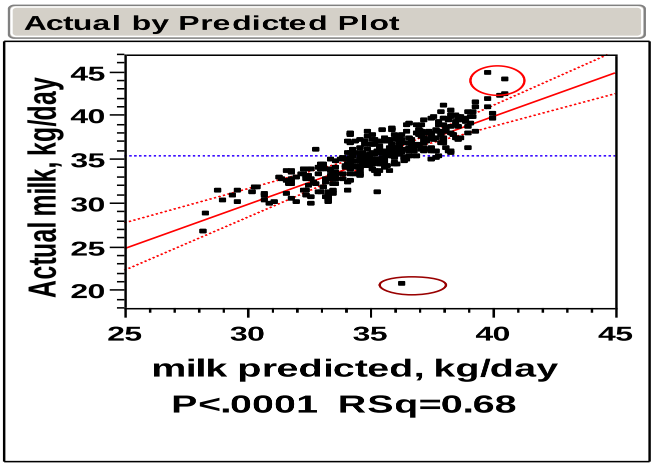
Estimating stocking density

The three topics, which are linked, should be addressed simultaneously. While the measures of the last two are objective, it is very difficult to estimate the stocking density. The recommended indexes (22 sqm/cow in loose stalls, and 100% cubicles in free stalls) do not necessarily represent the **actual** stocking density.

When we verify that the housing capacity or quality, and management of the herd were stable throughout the period analyzed, we calculate the monthly stocking density (**density**) as

percentages relative to the month with the lowest number of cows in milk in the period analyzed.
We estimated the independent effects of the **density**, **DIM** & **SCC** on yield (kg) from monthly data of actual marketing in a random sample of 19 herds (382 herd_months all together) applying a linear regression model, where we allowed for the effects of the various herds, months, and % of first lactation cows.
Figure 1 compares the predicted milk yields derived from the model to the actual ones. Except from those herd_months circled in red the fit was good and allowed us to apply the model to individual herds. **We estimated that losses of daily production of 0.54 kg and 0.52 kg per a lactating cow were associated with increases of 10% in density and 10 days in mean DIM respectively in our sample.**

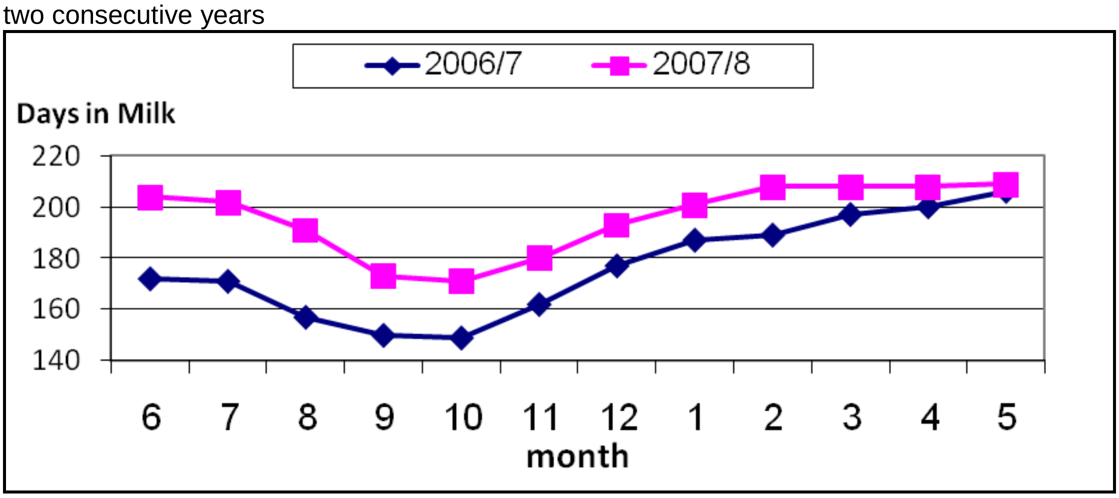
Figure 1. The effects of **DIM**, **SCC**, and herd **density** on daily yield (kg/milking cow) in 382 herd_months in 19 herds 2006/07. Actual vs. predicted production



In view of previous studies that described valid statistical associations between **SCC** and **density**, it was essential to establish whether the adverse effect of **density** on yield in out sample was due to an increase in **SCC**. When we added the mean monthly **SCC** to our model, the losses associated with 10% stocking density reduced from 0.54 to 0.40 kg/cow/day but were still statistically significant. **We could conclude that in our sample the adverse effects of stocking density, days in milk, and the somatic cell counts on production were independent of each others.**

Reduction of the mean Days in Milk (DIM)
Figure 2 describes the mean **DIM** of milking cows through two consecutive years in Herd #2. Similar increase in **DIM** is presently common to many herds. The two ways to reduce **DIM** are to improve fertility and to keep the number of abortions down.

Figure 2. Mean days in milk (**DIM**) for lactating cows in Herd #2. An increasing tendency in two consecutive years



Improving fertility

A routine Herd Health Analysis identifies factors which adversely affect fertility (see **International Dairy Topics—Volume 6 Number 4**) and contributed to the increased **DIM**. Table 2 describes the additional open days associated with a loss of ≥0.5 units of **BCS** over the dry period in a group of 186 ≥3rd lactations cows.

Table 2. The adverse effects of a loss of ≥0.5 u **BCS** over the dry period on some fertility indices in Herd #3

Third or more lactations cows						
Sample Herd	**total**		**% pregnant to first AI**		**open days**	
	186		**33.9**		**112**	
	yes	**no**	**yes**	**no**	**yes**	**no**
Lost ≥0.5 u BCS in the dry period	**21**	**161**	**19.0***	**36.6**	**134****	**109**

$p<0.05$; $^{**}p<0.01$

Reduction the number of abortions

The contribution of abortions to the **DIM** varies and reflects the stage of abortion in which the abortion took place and the herdsman's policy of culling. Table 3 compares data from two herds with different **abortion profile**.

Table 3. Contribution of abortions to mean **DIM** in two herds with different abortion profiles

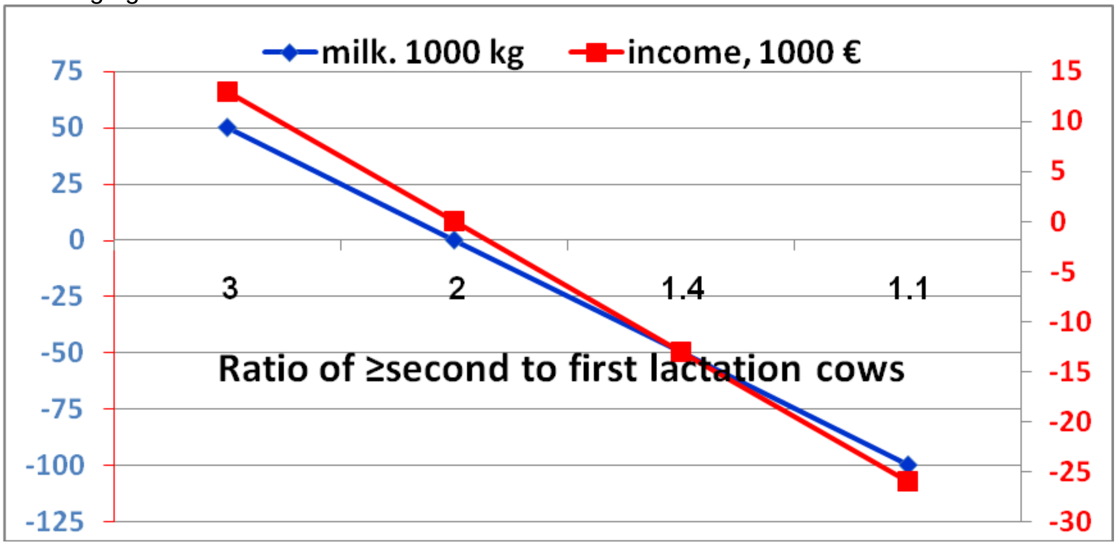
01/11/06-31/10/07	**Herd #4**	**Herd #5**
n Aborted	47	59
Abortions per 10,000_days_pregnancy	6.6	4.9
% Aborted	8.6	6.3
n Aborted twice	3	4
Abortion profile (Trimester of pregnancy)	**Third**	**First**
Additional open days for cows that became pregnant again	693	2079
n Cows culled without re-breeding	36	34

In contrast to Herd #4 the majority of the abortions in Herd #5 were in the first trimester of pregnancy; some of the aborting cows were rebred and conceived in the same lactation. While the economical damage associated with culling and replacement will be higher in Herd #4, the contribution of the abortions to the mean **DIM** will be greater in Herd #A.

Herd Structure

With the present breaking of the quota system, the relative number of first lactation cows in the herd is increasing; most herds are raising all of the heifers. The traditional ratio of first to ≥second lactations cows of 1:2 is rapidly changing. A narrower ratio is expected to increase the genetic value of the herd, but reduces the monthly cash flow. Figure 3 describes milk yields (1000 kg) and income (1000 €) in changing ratios of first to ≥second lactations cows relative to that of 1:2 in a hypothetical herd of 300 cows.

Figure 3. Milk (in 1000 kg) and income (in 1000 €) in a hypothetical herd of 300 cows related to changing ratios of first to ≥second lactations cows to that of 1:2



Difference in annual milk production is between first and older cows = 2000 kg; Dry matter intake of first is 90% of that of ≥second lactations cows.

Selection policy and culling

While rates of non-inseminated Israeli multiparous cows were stable in the years 2004-2006 (12.8%) it decreased in 2007 to 9.8%. On top of slowing down the genetic improvement in the national herd, reduced selection affects the 305 extended milk yields as shown in Herd #6. Rates of non-inseminated cows were 18.8% and 8.5% in the years 2006 and 2007 respectively, while the mean milk yield of first, second, and third or more lactations dropped between the two years 301 kg, 567 kg, and 794 kg respectively.

Culling of the "Marginal Cow"

We defined a "**Marginal Cow**" as a healthy cow, waiting to be culled and kept as long as profitable. Profitability of "marginal cows" should be evaluated continuously using in or extra quota prices. Table 4 describes such evaluation of the three lowest "marginal cows" in Herd #2.

Table 4. "Marginal Cows" in Herd #2, the three lowest profitable cows in the last monthly milk test.

#2 cow	milk kg/day	ecm kg/day	income from milk €/day	DMI kg/day	feeding costs €/day	income over feeding costs €/day	capital & Insurance €/day	income over costs €/day
5393	11.2	11.8	4.25	16.70	4.93	-0.68	0.50	-1.17
5478	13.0	13.5	4.85	17.30	5.10	-0.25	0.49	-0.74
5557	16.1	16.7	6.00	18.60	5.47	0.52	0.50	0.02

Increasing the stocking density

When housing conditions, nutrition and management were stable in the previous 24 months we apply the model described in Figure 1 to individual herds in order to evaluate the independent effects of **density**, **DIM**, and the **SCC** on the mean monthly yield. **We so established that in Herd #2, that a daily loss of 0.1 liters/milking cow (p<0.0001) was associated with an increase of 1% stocking density (2.2 cows).** Figure 4 describes the increasing **densities** in Herd #2 over the period 06/06-05/08. The herd is housed in **freestalls**, and the lowest number of milking cows was in July 2006 (222 cows in milk). The increase in **density** over the last two years is common to other herds.

Figure 4. Monthly stocking densities (%) in two consecutive years in a freestall Herd #2. 07/06 is the month with the lowest number of milking cows (222).

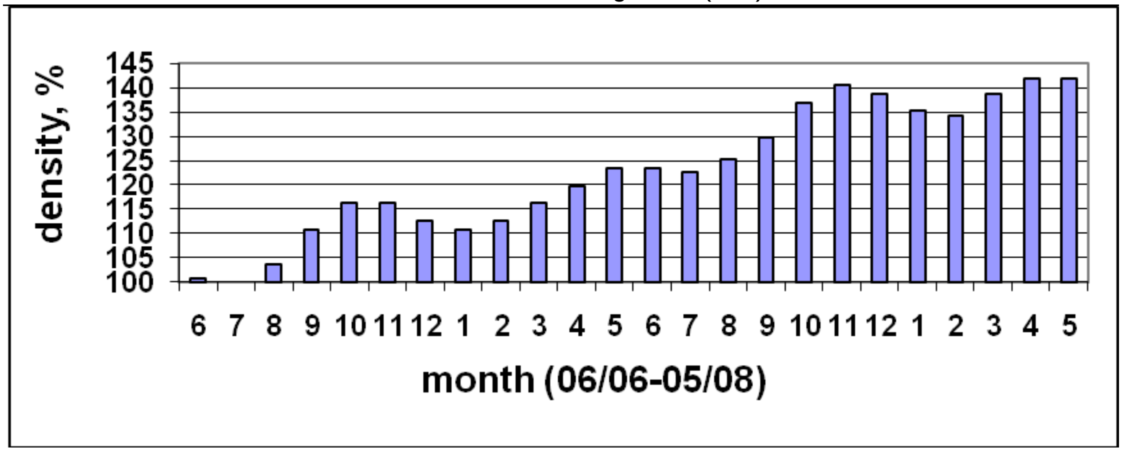


Table 5 describes the effects of the increasing stocking density (315 milking cows in the milk test of 05/08) on the daily milk production and income of Herd # 2. The balance in milk production and income will only be reached after culling of the extra 30 and 35 cows respectively.

Table 5. Additional daily **ECM** production and income in keeping the extra "marginal cows" in Herd #2 (milk test of 05/08, 315 milking cows).

n extra marginal cows to cull	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**
Extra daily ECM production, l	-1184.8	-975.8	-754	-523.4	-287.3	-33.6	229.7	498.3
Extra daily income, €	-186.5	-165	-138.9	-111	-81.6	-47.1	-10.3	27.6

Reducing the use of whole milk for feeding calves

Under the present prices, farmers use milk substitutes for young calves instead of whole milk, discarded milk (antibiotic or with high **SCC**) excluded. This amount should be reduced, and the breach of the biological security should not be underestimated, especially in herds that adopted any disease eradication programs.

Production "tricks"

Extra milking of fresh cows (6 times daily for 21 (28) days)

Various field observations suggest that the routine will add extra 300 to 800 kg per lactation, mainly in first lactation cows; energy balance however should be routinely evaluated. An example to a herd with adverse effects of negative energy balance **(NEB)** at the onset of lactation on fertility is in Table 6.

Table 6. Rates of cows open >150 **DIM** days in milk and **NEB** after calving in 198 ≥third lactations cows in Herd #1

		n cows		**open >150 DIM, %**	
		198		36.1	
Factor	**Rate/value**	**with**	**without**	**with**	**without**
Unobserved heat		106	92	51.0**	18.9
High FCM yield[a], kg	55.1	62	117	43.5**	29.9
High fat/protein in first test[a]	1.369	44	132	50.0*	29.5

FCM fat corrected milk; [a]Highest quarter; *p<0.05 **p<0.01

The severe adverse of unobserved effects on fertility suggest that the cows suffer from inactive ovaries. Both inactive ovaries, high fat corrected milk yield (**FCM**) and **high fat to**

protein ratio in the first monthly milk test suggest that the cows are in a continuous state of **NEB**.

In order to prevent a "**Negative Selection**" where high yielding cows are culled because of infertility or "metabolic calvings" it is not advisable for herds with an evidence of **NEB** to increase the number of daily milkings.

Short dry periods

Delaying drying off has gained popularity in recent years though the effects of late drying off is equivocal, and to extent depends on the cow **BCS** at drying off. Table 7 compares future yields and overall income of cows with **BCS** ≤3.25 units at drying off according to days in pregnancy when dried off.

Table 7. Losses of yield and income associated with late drying off of cows with **BCS** of ≤3.25 at drying off

Milk yield of "thin" 2nd lactation Cows (BCS of ≤3.25 at drying off)		
days pregnant at drying off	**>217 days, 74 cows**	**≤217 days, 122 cows**
305-d milk, kg	11,561	12,469
difference, kg	-908**	
"Penalty", €[a]	17,867	
Milk yield of "thin" >2nd lactation Cows (BCS of ≤3.25 at drying off)		
days pregnant at drying off	**>217 days, 112 cows**	**≤217 days, 126 cows**
305-d milk, kg	12,513	12,970
difference, kg	-456*	
"Penalty", €[a]	11,183	

[a]*[Extra milk in the present lactation compared to dry periods of 60 days] – [loss of milk in the next lactation + differences in prices of dry and lactating cows respectively]*

To conclude:

- Extra milk is not necessarily extra income
- Correction of managemental mistakes and controlling diseases are still the most efficient ways to increase production
- Reduction of abortions and improving fertility will reduce the mean days in milk and so will increase production of the herd
- Crowding cows in given housing facilities might lead to loss of income
- Profitability of the marginal cow should be regularly evaluated
- The "prize" associated with "production tricks" is often known, but not the penalty
- There is no "universal truth". Each herd has its own truth that should be looked for
- Extra production – yes! But not under all circumstances