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Factors Affecting Fertility of Dairy Cows in Israel

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Abstract. The objectives of this review are to describe the reproductive parameters monitored in Israeli dairy herds and to evaluate their changes in recent years. Eighty percent of the cows and 70% of the farms use the Israel Cattle Breeders' Association Herdbook and about 50% of them use pedometry systems. Intensive herd medicine is practiced in 80% of the herds by Hachaklait Veterinary Services Ltd. Herd-health reports monitor calving, production and reproduction. Causal analysis explains the effects and interactions of various risk factors involved. The average of 305 days of milk production per cow increased between 2004 and 2008 from 11,200 to 11,903 kg. At the same time the first A.I. conception rate (C.R) dropped from 43.0 to 40.7% and from 35.6 to 30.5% in primiparous cows (PC) and multiparous cows (MC), respectively. The waiting period (WP) was shortened from 106.2 to 93.4 days in PC and from 99.9 to 87.3 days in MC. The undetected heat rate per herd increased from 30.3 to 38.9% and from 33.9 to 43.9% in PC and MC, respectively. The average of days open per herd dropped from 127 to 118.4 and from 127.5 to 120.5 in PC and MC, respectively. The rate of cows open by 150 days in lactation dropped from 42% (± 10.2) to 34.2% (± 8.1) and 47.1% (± 8.8) to 39.5% (± 7.1) in PC and MC, respectively. The ratio between summer inseminations and winter inseminations increased from 0.81 to 1.04 from 2000 to 2008. The calving interval (CI) average fluctuated around 424.5 (± 2.0) days and 417.5 (± 1.7) days in PC and MC, respectively. The average duration of the dry period in 2008 was 60.7 (± 4.7, 47–72) days. From 2004 to 2008, the average herd rate of endometritis increased from 38.1 to 46.0% and from 25.5 to 30.1% in PC and MC, respectively. The milk fat to protein ratio in the first test day of lactation has remained steady during the past 5 years. Genetic trends in the breeding values of fertility and milk showed consistent improvement from 2000 to 2006. Conclusions: In recent years there has been a small decline in some reproductive parameters, while at the same time others have remained unchanged. The farmer's economical viewpoint and management practices have contributed to the changes.

Key words: Anestrous, Conception rate, Reproductive parameters, Summer

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Israel has 100,000 dairy cows kept in about 1,000 herds. More than 95% of these cows are Israeli Holstein. The herd sizes vary from small family owned farms with a few dozens to large Kibbutz farms with hers ranging from 250 to 900 cows. Dairy farms are spread throughout the country over areas with large variations in climatic conditions from the short, wet winters and long and humid summers along the Mediterranean coastal plain, through the hot, arid Negev and Jordan Valley, to the rainy and cooler climate conditions of the Galilee and Golan. All herds are kept in zero grazing conditions and although open barns serve as the most common housing system, there are a few free stall barns. In all of the Kibbutz farms, and some of the family farms, cows are milked three times a day. Most milking parlors are herring-bone or parallel, and recently, a few robotic milking systems have been installed. Almost all cows are artificially inseminated (AI), mostly with locally produced semen, and professional technicians serve several different farms. At the end of 2006, 70% of the herds, comprising close to 90% of the cows, were recorded monthly by the Israel cattle breeders' association (ICBA) dairy herd book. All large herds, as well as some of the smaller ones, use automatic systems for the identification of individual cows (mainly Afimilk™ and SCR). These systems automatically record milk quantity levels, milk electrical conductivity and record the number of cow steps or neck movements at each and every milking. More than half of the farms use comprehensive farm management software (NOA or Afifarm™). Most farms feed TMR Ad-lib produced on site or purchased and delivered daily to the feed bunk. Typical feed rations contain a high concentrate (>60%) and a low roughage with a variety of by-products available on the market. The farm-gate milk price is affected by fat and protein contents, somatic cell (SCC) and bacteria counts, as well as a summer-milk premium. In 2006, the average milk production per cow per year was 11,281 kg, with 3.58% fat and 3.17% protein. The highest producing herd reached over 13,000 kg per cow per year. The use of Bovine Somatotropin hormone is not used in Israel. Each farm has a milk production quota adjusted by the government according to demand that is divided into summer and winter quotas. Most farms rear their own replacement heifers aiming for first calving at 24 months of age and the average annual culling rate is 30%.

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Clinical Veterinary Services on Dairy Farms

Close to 80% of the dairy farms with more than 90,000 milking cows throughout Israel are served by the Hachaklait Veterinary Services Ltd. This is a non-government cooperative that belongs to the farmers and currently employs 50 vets working as field practitioners and consultants. During the past three decades Hachaklait

has been practicing intensive herd medicine whereby all client herds are routinely visited at least once a week, and all cows are checked several times per lactation. All relevant individual cow information, vet diagnoses and treatments are recorded on the farms by one of two commonly used types of dairy farm management software. Hachaklait has its own epidemiology unit (called Herd-Health department), established by Dr. O.Nir- Markusfeld, and gathers the relevant data from three sources: the farm, the AI cooperative (Sion Ltd.) and the ICBA herd book. Hachaklait produces a periodic (semi-annual or annual) monitoring report and multifactorial causal analysis for each farm. The report deals with major calving traits and diseases, reproduction, milk production and some of their economical implications. The parameters used are defined and monitored uniformly among the farms. These enable us to compare individual farm results nationwide and to their own results in recent years. The goals are set and updated annually based on the results of the better quartile of more than 100 Kibbutz farms. During an annual farm visit by one of the herd-health consultants, the report is discussed with the farm owners, management team and nutritionist. The farm gets recommendations and suggested corrections for the identified problems and its specific situation.

Parameters Monitored Routinely and Their Current Rates

A uniform list of parameters is used for all herds. These are divided into three categories: calving traits and diseases, reproduction and milk production. The following chapter covers the important and relevant parameters in calving and reproduction traits. Reproductive parameters and goals are set separately for replacement heifers, first lactation (primiparous) cows and second or higher lactation (multiparous) cows. All rates are updated to 2006 and are based on more than 100 herds with about 50,000 milking cows. A sample farm report demonstrating calving and reproductive parameters, rates and goals can be seen in Tables 2 and 3.

Calving Parameters (Indices Values of 2006)

Stillborn

Dystocia (difficult calving) is not measured directly since there are no uniform or accurate criteria to express the degree of intervention or effort used during calving on the different farms. Instead, we use the rate of stillborn calves at calving and up to 24 hours after calving. The herd annual mean rate in primiparous cows was 7.1% (ranging from 0 to 17.9%) and 5.9% (1–11.6) in multiparous cows. Almost no change was monitored in the past three years, and no statistically significant change from the rates in 1995 was noted. The rate of parturition induced in heifers by the vet was 4.4 % (0.0–21.7). Induction is analyzed in the farm report for its effectiveness. Farms are encouraged to measure the height and body weight of their replacement heifers, and to correct nutrition and management in order to achieve better growth results.

Twins

Twin birth is considered as a detrimental factor on calving diseases, production and reproduction and current mean rates are 0.8% (0–3.8) in primiparous cows and 6.5% (1.7–13.6) in multiparous cows.

Retained placenta

This is defined as the fetal membranes that are not expelled within 24 h post calving. The mean rates are 9.0% (0–21.1) and 13.1% (4.4–25.8) in primiparous and multiparous cows respectively. Some cases that are missed or not recorded by farm personnel are usually diagnosed later by the vet as endometritis. To overcome this, the two diseases are often jointly referred to as Uterine Diseases.

Endometritis

One of the corner stones of our intensive herd health program is that each cow is checked routinely by the farm vet between 6–12 days post partum. Endometritis diagnosis is done manually transrectaly and or intravaginaly. Treatment is administered by intrauterine Tetracycline tablets or infusions, and parenteral antibiotic injections in cases of elevated body temperature or septic metritis. Endometritis rates were 43.3% (11–86) and 27.2% (12–74) in primiparous and multiparous cows respectively. Part of the big variation between farms can be explained by the varying perceptions of normal or diseased uterus among the different vets in the field.

Ketosis

During the post partum routine check-up, cows are tested for ketonuria. In some herds all cows are tested while in others, cows are tested according to risk factors such as low milk production, twin calving, body condition, off-feed or other illnesses detected. Treatments include IV dextrose infusions, corticosteroid injections and drenching of glycerol or propylene glycol according to severity. Herd annual ketosis rates were 13.8% (5.0–49.2) and 17.8% (5.3–35.9) in primiparous and multiparous cows respectively. These values have been stable for the past three years. Ketosis, twins, retained placenta and endometritis are termed together as calving diseases in the causal analysis of risk factors affecting production and reproduction.

Other Factors Known to Interact with Reproduction

High milk production

High fat corrected milk (FCM) production is assumed to have an adverse affect on reproduction. The magnitude in each herd is affected by nutrition, management and other factors and therefore differs between herds. The causal analytic model compares cows in the higher producing third of each parity population in terms of milk production with the rest of the cows in the same parity with lower production levels.

NEB

Milk fat to milk protein ratios in the first monthly test day, and before and after the first AI, are used in the causal analysis as a

Table 1. Estrous cycles' length as detected by pedometry and were inseminated in 128 herds in 2007

Cycle Category	Length (Days)	Heifers Mean % (range)	Primiparous Mean %	Multiparous Mean %
Short	5–17	4.0 (0–13)	4.8 (0–14)	7.3 (1–17)
Medium (Normal)	18–24	63.7 (24–85)	62.9 (41–81)	58.6 (29–77)
Long	25–36	6.6 (0–20)	10.9 (3–19)	13.4 (7–22)
Double	37–60	25.8 (6–72)	21.4 (6–39)	20.7 (9–35)

parameter for negative energy balance (NEB).

Other calving diseases like prolapsed uterus, milk fever, LDA, udder edema and post calving mastitis are also monitored but are less relevant to this review.

Body condition score (BCS)

BCS is performed mostly by the vet and on some farms by herdsmen, three times per lactation: at the 6–12 days post partum examination, at "peak milk" (40–60 days in milk) and before drying off (around 200 days pregnant). Herd rates of over-conditioned cows (Š4.00), thin cows (ð3.00) at calving, cows that have lost half a unit or more during the dry period or between calving and peak milk scores are monitored, calculated and related to reproduction performance parameters.

Length of the dry period

This parameter has gained growing relevance in recent years since many farms try to shorten the dry period to produce more milk per cow and per herd. During the past three years, the mean rate of cows with a dry period longer than 70 days decreased from 27.1 to 20.5% (ranging 6.7–53.8% in 2006) per herd. The mean rate of cows with a dry period less than 60 days increased from 19.8 to 31.4% (ranging from 6.6–79.9% in 2006). The negative effect on milk production, disease and reproduction is analyzed at parity and herd levels.

Summer calving

In most parts of Israel, the hot and humid summer has a negative effect on both milk production and fertility of dairy cows. Cows exhibit shorter heats with a higher incidence of undetected heat and low conception and pregnancy rates. During the past decade, great progress has been made with various techniques and protocols for cooling cows by ventilation and watering. The negative effects of summer are still noticed when compared with winter results on the same farm. For this reason, summer calving is accounted for as a risk factor in the reproduction causal analysis.

SCC

Clinical mastitis and sub-clinical mastitis are thought to have a negative effect on reproduction. Since clinical mastitis is not well or uniformly recorded, udder health is expressed using somatic cell counts (SCC), which are monitored monthly. The SCC's effect on reproduction is evaluated in the model by comparing cows with high SCC to cows with low SCC in the same herd.

Reproductive Parameters Commonly Used in Israel

Waiting period

Elective and actual waiting periods differ between herds and years according to strategy and market trends. The mean values of waiting periods in 2006 were 99.0 days (74–134) for primiparous cows and 91.7 days (73–139) for multiparous cows. Both values are eight days shorter when compared to 2004 due to changes in farm policies.

Undetected heat

Herd heat detection methods vary from total dependence on automatic measurement of cow activity (pedometry) to combined visual observation with pedometry. All undetected or unobserved cows, during the whole waiting period or during the last 25 days, were recorded automatically as anestrous. The mean values of undetected heat were 25.3% (5.0–90.4), 34.7% (10.4–81.0) and 29.2% (12.6–80.9) in replacement heifers, primiparous and multiparous cows respectively. During the past two years, theses values have risen by 4% in heifers and primiparous cows, and dropped by 4.7% in multiparous cows.

Inactive ovaries

Transrectal ovarian palpation is performed weekly or bi-weekly by the vet on all anestrous cows. If a corpus luteum (CL) is palpated, the cow is considered undetected yet active, and is treated according to the farm protocol. Regardless of follicular presence, if no CL is palpated in two successive weekly checks, the cow is diagnosed as having inactive ovaries, meaning true anestrous. Ultrasonography is not used on a regular basis in the field, so this parameter accuracy is limited by the palpation skills of the vet. Inactive ovaries mean rates were 2.9% (0.0–16.5), 11.0% (0.0–32.3) and 10.6% (0.8–22.9) in heifers, primiparous and multiparous cows, respectively.

Heat cycle length distribution

Heat cycles are recorded and calculated only when an insemination is performed by the AI technician and not if a cow was detected in heat but was not inseminated. Table 1 shows the rates of each cycle length category per herd. The wide range of results is partially due to inaccurate cut-off points of the pedometry systems (affecting the sensitivity and the specificity), and partially due to cow BCS, production and disease interactions.

Not inseminated at 150 DIM

This parameter identifies cows that have not been considered for

Table 2. An annual calving report of a sample farm

Calving traits	Primiparous		Multiparous	
	Rate	Goal	Rate	Goal
a. Total calved	161		353	
b. % Twins	1.2	(0.0)	6.5	(5.1)
c. % Stillbirth	3.2	(4.7)	4.0	(4.3)
d. % Milk fever	0.0	(0.0)	5.7	(1.6)
e. % Prolapsed uteri	0.0	(0.9)	0.6	(0.5)
f. % Displaced abomasum	1.2	(1.0)	2.0	(1.5)
g. % Retained placenta	10.0	(5.9)	18.0	(10.2)
h. % Primary metritis	64.4	(34.1)	20.6	(17.8)
I. % Ketosis	13.1	(7.8)	28.1	(11.0)
j. % Calved with mastitis	3.1	(1.1)	0.3	(0.7)
k. % With Days Dry >70 days			10.2	(15.0)
l. % With Days Dry <60 days			61.5	(15.0)
m. % Induced calving	0.0	(10.0)	1.1	(2.0)
n. % Calved with udder edema	19.9	(10.0)	4.0	(5.0)
o. BCS at calving (n examined)	152		351	
1. % With BCS≥4.00	3.9	(15.0)	8.3	(15.0)
2. % With BCS ≤3.00	33.6	(15.0)	29.9	(15.0)
p. BCS change during dry period (n)			321	
1. % lost ≥0.5 u			18.7	(15.0)
2. % gained ≥0.25 u			24.9	(15.0)

The goals (in parentheses) change annually according to multi-herd best quartile results.

insemination, mainly due to a calving disease or those elected for culling. These cows do not influence the reproductive parameters and reproductive efficiency, but contribute substantially to production and financial losses. Mean rates were 12.9% (3.3–29.2) and 17.8% (5.6–47.6) for primiparous and multiparous cows respectively.

Days open

Days open is ranked on Israeli dairy farms as one of the most important reproductive parameters. High costs of feed and labor and aiming for the highest milk production make reduction of days open a major issue of concern. The mean values were 121.5 days (95–138) and 121.8 days (104–142) for primiparous and multiparous cows respectively. Both values are six days shorter than those recorded in 2004.

Open at 150 DIM

Since only pregnant cows are counted for days open we also monitor the rate of cows still open at 150 DIM. This point in the lactation is a significant stage for deciding whether to keep or to cull non pregnant cows. The mean herd rates of open cows at 150 DIM were 36.9% (12.8–66.7) and 42.3% (25.9–69.1) for primiparous and multiparous cows respectively. Heifers are monitored as being open at 18 months of age; the mean herd rate was 3.6% (0.0–30.9). Open cows at 150 DIM and herd mean days-open both depend on farm factors like the length of the elective waiting period, the efficiency of heat detection, and on cow risk factors that interfere with reproduction on each farm.

First AI conception rate

First service conception rates (CR) in 2006 were 64.9% (41.5–83.8), 42.6% (15.1–59.6) and 33.4% (8.6–59.3) in heifers, primiparous and multiparous cows respectively. It is often stated worldwide that when milk production increases, conception rates decrease. This phenomenon has not been recorded in our data. In Israel during the past 12 years despite a rise of more than 1,000 kg in the average milk production per cow per year, conception rates have remained similar. In 1994, CR was 65.6% in heifers 42.6% in primiparous and 34.7% in multiparous cows. This can be explained partially by the progress in improved summer cooling, better feed rations with high energy levels and the shutting down of the less efficient farms.

Abortion rates

Almost all pregnancy checks are performed by manual transrectal palpation, by vets, 40 to 50 days after AI. Every pregnant cow found empty after that, and before 260 days of pregnancy, is recorded as an abortion case, even if a fetus was found or if maternal signs were detected. Annual abortions rates were 6.3% (2.5–13.3) per herd and 4.6% (1.8–10.0) per 10,000 days of pregnancy. Trimester, season, parity and sire factors as well as possible abortion pathogens are analyzed, but will not be discussed in this review.

CI (calving interval) is not commonly used since it includes only cows that calved again, and it does not reflect non-inseminated or culled cows. Due to the strict milk quota policy farms have to cull high numbers of cows. The annual rate of elective and forced culling (~30%) limits the ability of ICI to properly express reproductive efficiency and its economical impact on the farm.

Pregnancy rate is calculated as the cumulative rate of pregnant cows in the herd at any given time from calving, which is different from the way this parameter is calculated and used in the USA.

Table 3. An annual reproduction report of a sample farm

Reproduction	Primiparous		Multiparous	
	Rate	Goal	Rate	Goal
a. Total calved	172		359	
b. % Not inseminated at 150 DIM	9.9	(10.0)	7.5	
c. BCS lost from calving to 1st AI (n)	144		315	
% lost ≥0.5 u	49.3	(40.0)	75.6	(40.0)
d. % Unobserved heat	41.9	(26.6)	55.4	(31.3)
e. % Inactive ovaries	11.6	(5.9)	12.7	(6.9)
f. Mean rest period (days)	103.0		90.0	
g. % Pregnant to first service	48.4	(47.4)	34.9	(38.2)
h. % Open >15DIM	34.2	(31.6)	38.8	(36.7)
i. Mean days open (150 day limit)[a]	120	(117)	121	(116)
j. Cycles distribution (%)				
1) Total	141		409	
2) Short cycles, 5–17 day	2	(3)	1	(5)
3) Medium cycles, 18–24 day	69	(72)	63	(66)
4) Long cycles, 25–36 day	10	(9)	13	(12)
5) Double cycles, 36–60 day	19	(16)	22	(17)

[a]The goals (in parentheses) change annually according to multi-herd best quartile results.

Cystic ovaries rate is difficult to monitor without using ultrasonography due to diagnosis discrepancies among vets. It is difficult for a practitioner to differentiate between a large dominant follicle, an anovulatory follicle, a follicular cyst or a luteal cyst on their weekly visits. Response to hormonal therapy using Ovsynch or other protocols further limits the accuracy of this parameter.

Services per conception is the number of inseminations required to impregnate a cow.. The rates in 2006 were 1.7, 2.8 and 3.2 for heifers, first lactation and older cows, respectively.

Causal Analysis of Infertility

The causal analysis part of the herd report follows the descriptive part. This part attempts to determine and explain the effects of different factors on the production and the reproduction in a given time period, in a specific herd. The detailed information on an individual cow enables causal analysis to be executed at cow level and not at herd level. This is done by comparing cows suffering from a certain ailment or risk factor with cows in the same herd that do not have these traits. Certain factors can have a significant effect on one farm, and little or no effect on a neighboring farm. As quoted: "each herd has its own truth". The causal analysis enables the farm management to gain a deep understanding of the various interactions in their unique situation.

The various factors recognized as having adverse effects on fertility are analyzed using logistic or linear regression models (Table 3). In large enough herds, the risk factors are analyzed separately for first, second, and older lactations. In smaller herds, they are done on the entire cow population. Rates are presented for the dichotomous variables (calving diseases and summer calving). Quartile values are presented for the continuous variables (high milk yield before service, high milk yield before drying off and low BCS at calving). In small herds, median or quartile values are presented. Another model analyzes the cows' odds ratio of becoming anoestrus in a specific herd using calving diseases, BCS score, BCS changes and milk fat to protein ratio as risk factors.

Results of Major Reproductive Parameters Updated up to 2008

The average of 305 days of milk production per cow increased between 2004 and 2008 from 11,200 to 11,903 kg. At the same time, the first A.I. conception rate (C.R) dropped from 43.0% to 40.7% and from 35.6% to 30.5% in primiparous cows (PC) and multiparous cows (MC), respectively. The average waiting period (WP) in days went up from 1996 to 2004 and then dropped again from 106.2 (± 12.8, 76–159) days to 93.4 (± 9.9, 74–134) days in PC and from 99.9 (± 12.8, 75.0–140) to 87.3 (± 10.1, 70–140) in MC from 2004 to 2008. The first A.I. CR changed similarly during those years with a drop from 2004 to 2008 (Fig. 1). The undetected heat rate per herd increased from 30.3% (± 12.3, 10.2–71.7) to 38.9% (± 15.2, 10.4–92.2) and 33.9% (± 11.5, 10.0–68.8) to 43.9% (± 13.6, 13.4–91.0) in PC and MC, respectively. The average of days open per herd dropped from 127 (± 7.7, 104–149) to 118.4 (± 6.8, 102–139) and from 127.5 (± 7.1, 107–144) to 120.5 (± 6.3, 105–143) in PC and MC, respectively. The rate of cows open by 150 days in lactation dropped from 42% (± 10.2) to 34.2% (± 8.1) and 47.1% (± 8.8) to 39.5% (± 7.1) in PC and MC, respectively. Summer months are from July to September. CR in the summer is 15% lower than the rest of the year. In recent years, farmers have received premium for summer milk and increased summer inseminations despite the known detrimental effect on CR. The ratio between summer and winter inseminations increased from 0.81 to 1.04 from 2000 to 2008. The drop in CR corrected for the "summer shift" of AI was 2.9% from 2000 to 2008 and only 1% lower comparing 2008 with 1998 (Fig. 2). The number of services per conception between 2000 and 2008 has been steady for heifers (1.7–1.8), varied between 2.6 to 2.9 for first lactation cows, and

Table 4. Risk factors which affect reproduction on a specific farm in third or higher lactation cows

Farm result		n 185		Pregnant 1st AI 29.2 %		Open at 150 DIM 45.6 %		Days Open 126	
factor	value	with	without	with	without	with	without	with	without
Calving diseases		79	106						
Undetected heat		114	71						
High yield before service[1]	57.4	57	112						
Short rest periods[2]	83	64	121					121†	130
Summer calving		74	111					123†	131
Low yield at drying off[1]	1,804	58	111	20.7†	33.3	56.9*	38.7		
High yield at drying off[1]	2,538	57	112					134†	124
Dry periods shorter <56 days		50	135						
Dry periods longer >63 days	0.0	47	138	0	32.6				
Low BCS at calving[1]	3.00	45	140						
High BCS at calving[1]	3.75	58	127						
Lost ≥0.5 u BCS in dry period		25	159						
Gained ≥0.25 u BCS in the dry period		62	159						
Lost ≥0.5 u BCS before service		142	30						
High fat/protein at 1st AI[1]	1.102	43	126						
NEB at calving	1.374	43	126					133†	126
Lameness		26	143						
High SCC		36	121						

Only differences which were statistically significant are shown. †P<0.1; *P<0.05; **P<0.01

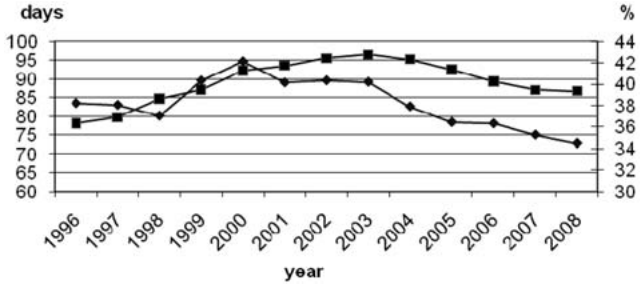

Fig. 1. The changes in annual average waiting period in days and first AI CR (%) in 234 Kibbutz herds in Israel. —■— Waiting Period, —◆— 1st AI CR.

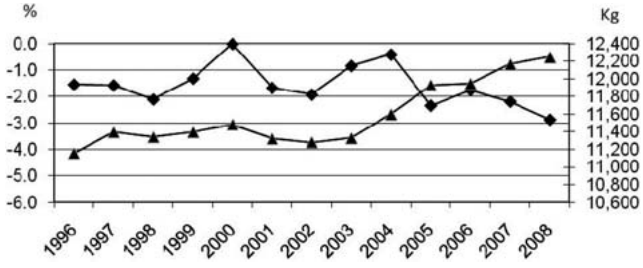

Fig. 2. Average annual CR deviation adjusted for "summer shift" of AI and adjusted ME milk yield in Kibbutz herds, using the year 2000 as a 0 value. —◆— Adjusted average including summer AI shift, —▲— Adjusted milk Kg 305 d.

increased from 3.0 to 3.5 in older cows. The calving interval (CI) average fluctuated around 424.5 (±2.0) days and 417.5 (1.7) days in PC and MC, respectively (Fig. 3). The average duration of the dry period in 2008 was 60.7 (±4.7, 47–72) days. The rate of cows per herd with a short dry period (<60 days) increased from 19.8% (±9.7) to 43.9% (±18.4) while the long dry period (>70 days) dropped from 27% (±9.2) to 15.5% (±6.8%) in 2004 and 2008, respectively. The average culling rate due to fertility between 2000 and 2008 was 4.4 % (±0.7).

The average twin birth rate per herd remained steady, 1.1 and 1.2% in PC and 6.45 and 6.7% in MC in 2004 and 2008, respectively. The stillborn birth rate dropped during the same years from 7.1% (±3.3, 0–18.8) to 6.4% (±3.1, 0–14.9) and from 6.2% (±2.6, 1–25) to 5.7% (±2.2, 0.6–11.8) in PC and MC, respectively. Post calving uterine diseases are treated earlier and differently from some other countries. From 2004 to 2008, the average herd rate of retained placenta dropped from 9.9 to 5.3% and from 13.1 to 10.5% in PC and MC, respectively. During the same period the average herd rate of endometritis increased from 38.1% to 46.0% and from 25.5 to 30.1% in PC and MC, respectively. Negative energy balance is monitored by ketosis, body condition score, and the milk fat to milk protein ratio. The average ketonuria rate per herd remained steady, 13.5% (±8.8) and 15.4 (±9.4) in PC and 21.0% (±9.8) and 22.0% (±10.3) in MC, in 2004 and 2008, respectively. The milk fat to protein ratio in the first test day of lactation has remained steady during the past 5 years.

The genetic trends in the breeding values of cows, rated according to year of insemination, have shown an improvement in recent years, both in conception rate and in milk production (Fig. 4).

The use of hormonal therapy (GnRH and prostaglandins) for fer-

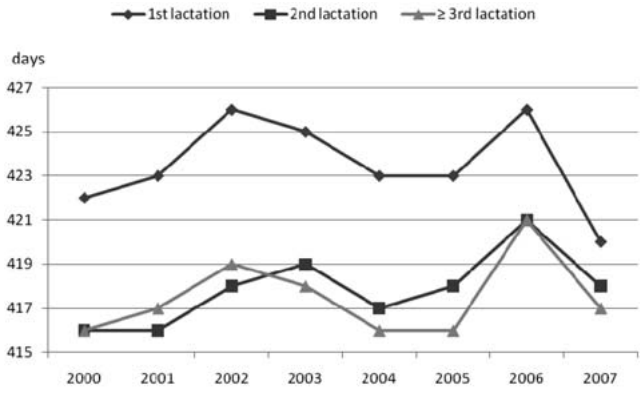

Fig. 3. Annual average of calving interval length in days in 234 herds in Israel.

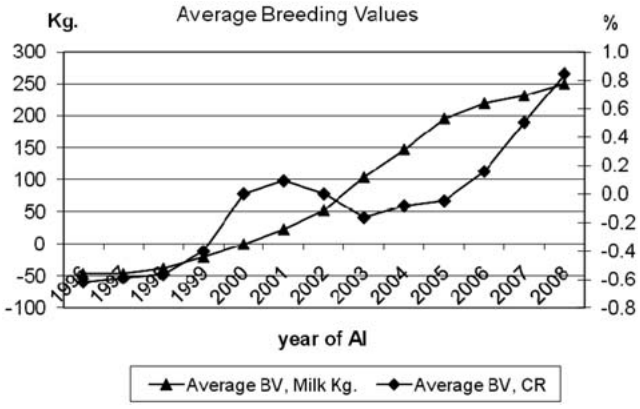

Fig. 4. Average breeding values for CR (%) and for milk production (kg) in Kibbutz herds from 1996 to 2008. *J Reprod Dev*, Vol. 56, Suppl, 2010.

tility in Israel is limited to cows with undetected heat, based on the veterinarian diagnosis per individual cow, and is rarely used for large scale synchronization programs. CIDRs (PRID) are rarely used on most farms.

A multifactorial model was set to analyze the effects of farm, year, parity, number of A.I., A.I. technician, month of the year, and days from calving to each A.I. The model included 1,418,091 inseminations in 234 Kibbutz herds. All main factors were found to have a significant effect ($P<0.05$) except for the year of insemination. The simple drop in the mean CR for 1–5 A.I., using 2000 as a reference year, was 6%, while the drop in the mean CR corrected for all the effecting factors in the model was 3.4%.

Conclusions and Discussion

There has been a drop in CR, but it is difficult to see a clear tendency. Low CR in the years 2001–2002 was similar to 2005–2006, while higher CR 1996–2000 was similar to 2003–2004. The drop from 2006 to 2008 is successive and worrying. The change may be related to other factors not discussed in this paper, such as climate, increased milk production, nutrition, overcrowding and Time will tell if the tendency remains the same or keeps fluctuating and additional research may clarify more factors.

High yielding dairy cows' reproductive efficiency is affected by a variety of factors. Detailed and accurate monitoring of these factors can give a clearer picture of a herd profile. The interactions between these factors may differ in each herd and should be evaluated in a risk analysis. Presenting a farm its own profile and quantifying the economical impact of each risk factor on reproduction, serves as a useful tool for the farm management to correct and improve its results. Synchronizing parameters globally is important. However, each country has its own market agenda and uniqueness, and caution should be practiced in drawing uniform conclusions. In recent years there has been a small decline in the first AI CR and an increase in the anestrous rate mostly due to the shortening of the waiting period and shifting inseminations towards the summer. However, days open and the dry period have been shortened, and the CI has remained unchanged. Since cows are dried off with 20–35 kg of milk per day and the tendency in recent years is to have a dry period of less than 60 days, the chance of having obese cows at the beginning of the next lactation is slim. Increased milk production and energy demand must have a toll on fertility. The large variability among herds is reflected by the wide range in reproductive results. These herd variations are primarily due to management and not breeding or selection. Fertility has been included in the breeding index in Israel for many years and farmers pay attention to fertility when selecting the bull. The ability of elite farms that use the same genetics, and are located in the same region with the same climatic conditions to have top production (>13,000 kg/cow/305 days) and good fertility at the same time indicates that success is mostly a result of better nutrition, housing, cooling, heat detection, AI and veterinary medicine. Modern farm managers are driven by profit and cost-benefits and prefer success parameters that differ from veterinary or reproductive parameters. Dynamic farmers respond quickly and drastically to changes in milk quota, the premium paid for low SCC or summer milk, and tend to overlook the classical parameters. Intensive management combined with comprehensive and detailed herd data are useful tools for minimizing reproductive losses. The veterinarian can play a leading role in achieving and maintaining these goals for the farm's benefit.