2

Egypt. J. Anim. Prod., 29, No. 1, pp. 17 - 41 (1992)

Evaluation of Imported and Locally-born Friesian Cows Raised in Commercial Farms in Egypt 1 - Models and Non-genetic Effects

E.A. Afifi,[1], M.H Khalil[1]. and M.A. Salem[2]

1 - Department of Animal Production, Faculty of Agriculture at Moshtohor, Zagazig University, Banha Branch, Qalyoubia, and 2 - General Cooperative of Developing the Animal Wealth and Products, Dokki, Cairo, Egypt.

AN analysis of cow productivity of two commercial Friesian herds (namely Mashal and Kombera in Gharbia and Giza Governorates, respectively), was carried out on 1646 lactation records. The two herds belong to the General Cooperative of Developing the Animal Wealth and Products (GCDAWP). Data were collected in the period from 1981 to 1988 on yield of milk recorded in 90 days (90DY), 305 days (305DY) and total lactation yield (TY), lactation length (LP), dry period (DP), age at first calving (AFC), days open (DO) and calving interval (CI).

Averages of 90DY, 305DY, TY, LP, DP, AFC, DO and CI were 1503 kg, 3838 kg, 4028 kg, 304 days, 69 days, 27.5 months, 100 days and 381 days, respectively. Herd effects were significant ($P < 0.05$ or $P < 0.01$) for 305DY, TY, DP and DO, and non-significant for 90DY, LP, AFC and CI. Cows of Mashal farm recorded higher 305DY and TY, longer DP and shorter LP, DO and CI than those of kombera. Locally-born cows in Mashal farm had higher 90DY, TY, LP, DO and CI and shorter DP than the imported ones, while imported cows in kombera had higher 90DY and 305DY (and shorter LP, DP, Do and CI) than locally-born cows. AFC of imported or locally-born heifers was significantly affected ($P < 0.01$) by year and season of birth. As year of calving advanced milk yield increased ($p < 0.001$), along with a decrease in LP ($P < 0.001$), DO ($P < 0.05$)

and CI (P < 0.01). Summer-born heifers (imported or locally-born) calved for the first time at younger age than those born in other seasons of the year. Spring-calvers recorded the highest milk yield and the longest LP along with the shortest DP compared to those calved during other seasons. Milk yield and LP are curvilinearly affected by parity (P < 0.001), while DP decreased (P < 0.05) with the increase of lactation number up to 5th and increased thereafter. DO and CI increased linearly (P < 0.05 or P < 0.001) as parity advanced up to the 6th. No consistent trend for the effects of age of cow within each parity on milk yield traits was observed, while length of LP, DP, DO and CI decreased in a linear manner as age of cow (within each parity) advanced. Milk yield traits, LP, DP and CI increased in a curvilinear manner (P < 0.001) with advance of DO. Milk yield traits and LP increased considerably (P < 0.05 or P < 0.001) with the increase of length of preceding dry period (PDP), while non-significant effects on DO and CI were observed . The highest average of milk yield and LP was recorded when PDP ranged between 100-160 days, while means of DO and CI in different PDP classes did not show any specific trend.

Keywords: Friesian cattle, evaluation, lactation, reproduction.

Importation of Friesian cattle in Egypt (as pregnant heifers) by the General Cooperative of Developing the Animal Wealth and Products (GCDAWP) began in 1981 from the Netherlands and West Germany. Since that time, large-scale commercial herds (belonging to such association) were raised in Egypt. The purposes of the present study were (1) to study the effect of age at first calving and other non-genetic factors affecting the performance of imported Friesian cattle in Egypt, and (2) to comare the performance of these imported cows with their locally born daughters.

Material and Methods

Location and management

This study was carried out using the productive and reproductive records of two commercial Friesian herds belonging to the GCDAWP. The two herds of Mashal and Kombera are located in Gharbia and Giza Governorates, respectively. In both herds, cows were housed in open sheds. All cows were fed concentrates all the year round. During winter and spring months (from December to May), animals were supplied with Egyptian clover *(Trifolium alexandrinum)* while during summer and autumn months (from June to the end of November) berseem hay, beet roots, maize and green sorghum *(Sorghum Vulgar Var Saccaratum)* were available. Also, rice straw was available all the year round. Cows were supplemented with dry concentrates proportional to their weight and production. Growing heifers and pregnant cows were given extra quantities of concentrates during the last two months of pregnancy according to their weight and pregnancy requirements. Fresh clean water and mineral mixture were available all the time.

Cows were machine milked twice daily at 05.00 and 17.00 hrs. Cows were usually milked until two months before the following expected calving date. Then if they did not go dry, they were dried off gradually by intermittent milking.

Breeding plan

Mating was always natural. Usually two bulls were assigned for 45 females. Heifers were first attempted for service when they reached 16-18 months of age (about 325-350 kg body weight). Cows were served during their first heat period following the 60th day post-partum. Pregnancy was detected by rectal palpation 60 days after the last service. Heifers or cows that failed to conceive were reared in the next heat period. Bulls were chosen for breeding purposes at 2-3 years of age. They were evaluated before being used for body conformation and for semen characteristics.

Data

Data were collected over a period of eight consecutive years (1981-1988). Sires of most cows included in the present study were unknown. Abnormal records (those of lactation period of less than 200 days and of greater than 550 days) and those records for aborted cows were excluded (about 220 lactation records). All records without breeding dates were also excluded. A total number of 1646 complete lactations by 431 cows which had more than one lactation were included in the study. Lactation records of cows were grouped into age subclasses of 3-month interval within each parity (about six classes). Lactation records were also grouped into days-open subclasses of 20-day interval. Moreover, lactation records were grouped into nine subclasses of preceding dry period (PDP) fo 20-day interval starting from 20 days.

Productive traits studied were 90-day milk yield (90DY), 305-day milk yield (305DY), total milk yield (TY), length of lactation period (LP) and length of dry period (DP). The 90-day milk yield was considered as initial milk yield. Reproductive traits were age at first calving (AFC), days open (DO) and calving interval (CI).

Statistical analysis

Data were analysed using Harvey's (1987) mixed model computer program. Table 1 includes the list of traits analysed and the factors that were presumed to contribute to their variability. Mixed models were fitted where cows within herd (as random effects) contributed significantly to variance components associated with differences among cows having repeated measurements. Herd, year and season of birth or calving, parity, days open and PDP were considered as fixed effects. Sources of cows were nested within herd while age of cow nested within parity.

Results and Discussion

Means and variation of uncorrected records

Means, standard deviations (SD) and coefficients of variation (CV%) for 90DY, 305DY, TY, LP, DP, AFC, DO and CI are presented in Table 2. Means of 90DY (1503 kg), 305DY (3838 kg) and for TY (4028 kg) reported here are much higher (along with shorter DP and LP) than those reported for Friesian cattle in most of the Egyptian studies (Ragab *et al.,* 1973; Badran, 1978; Abdel-Glil, 1985; Arafa, 1987; Mohamed, 1987; khattab and Ashmawy, 1988; El-Sedafy, 1989). However, results reported here indicate that cows of the commercial farms were higher in their milk yield and generally of better performance than those in the state farms. This may be due to that management and feeding systems prevailing in the commercial farms were better than in governmental ones.

Mean of AFC (27.5 months) is lower than those reported by many studies on Friesian cattle in Egypt, mainly in state farms (*e.g.* Ashmawy, 1975; Badran, 1978; Abdel-Glil, 1985; Arafa, 1987; Mohamed, 1987; El-Sedafy, 1989) which ranged between 30.0 and 35.2 months. Low estimates for DO and CI (100 and 381 days, respectively) obtained in the present study are lower than those reported for Friesian in Egypt (Ragab *et al.,* 1973; Ashmawy, 1975; Arafa, 1987; Mohamed, 1987; Khat-

TABLE 1. Models and model components used for the analyses of data.

		Model components											
Trait	Model	Herd i	Cow* within herd ij	source within herd ik	Year L	season m	Parity n	Age within parity no	Days open p	Preceding dry period q	Herd X year il	Herd X season im	Year X season lm
90DY, 305DY, TY, LP, DP, DO and CI	Model 1	X	X	X	X	X	X	X			X	X	X
305DY, TY, LP, DP. and CI	Model 2	X	X	X	X	X	X	X	X		X	X	X
90DY, 305 DY, ty, LP, DO, and CI	Model 3	X	X	X	X	X	X	X	X	X	X	X	X
AFC	Model 4	X		X	X	X					X		

* Cows within herd are considered as a random effect.

TABLE 2 . Means , standard deviations (SD) and coefficients of variation (CV).

Traits	No	Mean	SD	CV%
90DY (kg)	1646	1503	572	21.9
305DY (kg)	1646	3838	1272	23.2
TY (kg)	1646	4028	1431	25.6
LP (days)	1646	304	70	19.1
DP (days)	1276	69	36	47.9
AFC (months)	424	28	3	9.1
DO (days)	1184	100	63	51.8
CI (days)	1276	381	67	14.1

tab and Ashmawy, 1988; El-Sedafy, 1989). These results indicate that reproductive performance of cows in commercial farms were better than those in governmental ones.

Estimates of CV given in Table 2 showed that variation in DP and DO were relatively high compared with other traits. This confirms those results obtained for Friesian cattle raised in Egypt (Ashmawy, 1975; Badran, 1978; Abdel-Glil, 1985; Mohamed, 1987; Khattab and Ashmawy, 1988; El-Sedafy, 1989). Smaller variation in CI than in DO could be attributed to that most of the variation is brought about by variation in DO while the variation in gestation length is small. However, high variation in productive and reproductive performance of Friesian cattle raised in Egypt could be attributed to the variation in management decision and to the efficiency of heat detection.

Herd

Results given in Table 3 (Model 1) showed that differences between the two herds in 305DY, TY, DO and DP were significant ($P < 0.01$), while non-significant differences were found for 90DY, LP, AFC and CI. These results are in general agreement with those of many investigators working on Friesian cattle in Egypt (*e.g.* Mohamed, 1987; khattab and Ashmawy, 1988; El-Sedafy, 1989).

TABLE 3. F-ratios of least squares analysis of variance for factors affecting different traits of Friesian cattle (Model 1) .

Source of variation+	df	F-ratio 90DY	305DY	TY	LP	df	F-ratio DP	df	F-ratio DO	df	CI
Herd (H)	1	0.29ns	8.34**	7.51**	1.13ns	1	5.44**	1	4.81*	1	0.16ns
Cow within herd	429	2.36***	3.10***	3.13***	2.11***	424	1.34***	421	2.08***	424	2.23***
Source of Cow within 1st herd	1	0.01ns	0.01ns	0.59ns	6.57**	1	0.67ns	1	1.12ns	1	2.56ns
Source of Cow within 2nd herd	1	0.73ns	0.93ns	0.62ns	22.50***	1	0.14ns	1	13.70***	1	18.11***
Year of calving (Y)	7	34.66***	8.40***	6.80***	8.02***	6	2.00ns	5	2.45*	6	2.77**
Season of calving (S)	3	2.73**	1.79ns	5.36***	9.10***	3	0.23ns	3	1.65ns	3	1.68ns
Parity	5	20.72***	8.51***	5.42***	5.40***	5	1.66ns	5	2.38*	5	5.73***
Age at calving :											
Ages within 1st parity	3	2.41ns	0.84ns	0.33ns	4.53**	3	1.61ns	3	9.30***	3	5.75***
Ages within 2nd parity	5	3.05**	1.86ns	2.80**	5.79***	5	3.30**	5	8.77***	5	7.57***
Ages within 3rd parity	6	0.63ns	0.47ns	0.49ns	2.62**	6	4.03***	6	8.50***	6	6.47***
Ages within 4th parity	5	1.71ns	2.04ns	3.61**	5.83***	5	1.09ns	5	9.63***	5	6.33***
Ages within 5th parity	5	0.76ns	1.35ns	2.63*	4.88***	4	0.73ns	5	7.02***	4	5.15***
Ages within 6th parity	5	1.04ns	2.13*	2.33*	6.42***	1	0.22ns	5	5.34***	1	1.54ns
H X Y	7	52.09***	17.39***	13.02***	4.00***	6	5.04***	5	2.12ns	6	2.66**
H X S	3	6.85***	2..66*	2..79*	3.95**	3	1.66ns	3	3.79**	3	5.89***
Y X S	21	6.18***	3.18***	2.83***	2.96***	18	1.86**	15	1.30**	18	2.26**
Remainder df	1138					783		694		783	
Remainder mean squares		108745	790233	1065656	3397		1091		2674		2890

ns Non-significant (p>0.05) ; $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$.

+Herd effect tested against cow-within-herd effect while other effects tested against remainder .

AFC of heifers in Mashal farm did not differ from heifers in kombera (Table 4). Higher 305DY and TY and shorter LP, DO and CI in Mashal farm than in Kombera were observed (Table 5). Also, DP was longer in Mashal than in kombera.

Source of cow

Differences in milk yield and DP of imported and locally-born cows in both of the two farms (Model 1) were not significant (Table 3). Ashmawy (1975) reported that source of cow accounted for 3.7% of the total variance of DP ($P < 0.01$). Variation in LP due to source of cow in either of Mashal or kombera farms was significant ($p < 0.01$ or $P < 0.001$). Results of the present study disagree with those of Badran (1978) who showed that LP of the locally-born daughters did not differ significantly from LP of their imported Friesian dams. Differences in DO and CI due to source of cow were non-significant in Mashal farm, while they were significant ($P < 0.01$) in kombera farm (Table 3). Badran (1978) found that the origin of Friesian cows has no effect on their reproductive efficiency in Egypt.

Mean of AFC of locally-born daughters did not differ significantly from that of their imported Friesian dams (Table 4). Badran (1978) reported that imported pregnant heifers calved in Egypt at younger age than their locally-born daughters.

Locally-born cows in Mashal farm produced more 90DY and TY and recorded longer LP along with shorter DP than the imported Friesian ones (Table 5). Similar trend for Friesian cattle in Egypt was reported by Badran (1978) and Abdel-Glil (1985). Contrary to this trend, imported Friesian cows in Kombera farm produced more 90DY and 305DY along with shorter LP and DP than locally-born cows. Milk yield produced by imported cows in kombera farm was generally higher than that produced by imported cows of Mashal, while locally-born cows in Mashal produced more milk than those cows locally-born in kombera. Imported cows in Mashal farm had longer LP and DP than imported cows in kombera, while locally-born cows in kombera farm had longer LP and DP than locally-born cows in Mashal (Table 5).

Means of DO and CI within each herd for locally-born daughters were higher than those of their imported Friesian dams (Table 5), *i.e.* reproductive efficiency of imported cows was better than locally-born cows. Lengths of DO and CI of imported cows in kombera farm were shorter and consequently they and better reproductive efficiency compared to imported cows in Mashal, while locally-born cows in kombera farm had longer DO and CI than those locally-born in Mashal.

TABLE 4. Least-squares means (±standard errors) and tests of significance of main effects on age at first calving (AFC) of Friesian cattle (Model 4).

Independent variable	N o	Mean±SE
Herd :		**(F=0.3ns)**
Mashal	168	27.7±0.31
Kombera	256	27.5±0.19
Source of cow :		**(F=0.1ns)**
Imported	258	27.5±0.49
Locally-born	166	27.7±0.35
Year of birth :		**(F=2.7**)**
1979	153	26.9±0.44
1980	57	26.6±0.51
1981	32	27.9±0.46
1982	49	28.3±0.54
1983	69	28.6±0.35
1984	27	27.1±0.63
1985	37	27.8±0.71
Season of birth within 1st source (imported)+ :		**(F=11.3***)**
Winter	58	29.1±0.55
Spring	119	28.2±0.52
Summer	37	26.2±0.63
Autumn	44	26.4±0.64
Season of birth within 2nd source (locally-born)+ :		**(F=4.4**)**
Winter	34	28.3±0.52
Spring	42	28.6±0.45
Summer	40	26.9±0.52
Autumn	50	27.1±0.52

+Means underlined are the lowest for AFC .
nsNon-significant ; **P<0.01 ; ***P<0.001 .

TABLE 5 . Least-squares means and standard errors of main effects on different traits of Friesian cattle (Model 1).

Independent variable	No	90DY (kg) Mean±SE	305DY (kg) Mean±SE	TY (kg) Mean±SE	LP (days) Mean±SE	DP (days) No	DP (days) Mean±SE	DO (days) No	DO (days) Mean±SE	CI (days) No	CI (days) Mean±SE
Herd :											
Mashal	738	1398± 35	3699±112	4359±130	377± 5	569	64± 3	505	128± 6	596	457± 8
Kombera	908	1417± 37	3383±114	4009±134	383± 6	680	57± 3	679	141± 7	680	459±8
Source of cow within Mashal :											
Imported	468	1382±194	3727±588	4024±686	314±32	386	76±16	298	105±29	386	418±33
Locally born	270	1414±199	3671±604	4694±704	440±33	210	52±17	207	151±30	210	495±35
Source of cow within Kombera :											
Imported	697	1555±214	3804±643	3611±749	248±36	529	51±18	528	50±32	529	340±37
Locally born	211	1279±219	2962±656	4408±764	519±37	151	64±19	151	231±33	151	579±38
Year of calving :											
1981	139	795±197	2897±533	4363±619	537±34	135	36±18			135	548±31
1982	182	1123±149	3203±407	4420±472	486±26	166	46±13	217	156±23	166	515±23
1983	220	1611± 96	3823±263	4839±306	451±16	191	54± 7	191	162±14	191	490±14
1984	202	1629± 51	3778±146	4568±170	410± 8	162	61± 4	161	147± 9	162	461± 9
1985	266	1563± 44	3683±129	4150±150	358± 7	210	63± 6	205	121± 8	210	418±12
1986	264	1441± 89	3458±247	3773±287	321±15	221	82±12	220	120±13	221	403±21
1987	244	1530±142	3851±388	3956±451	283±25	191	82±18	190	100±20	191	371±31
1988	129	1569±197	3634±533	3404±619							

TABLE 5 . (Cont.)

season of calving:											
Winter	350	1423±47	3563±136	4258±158	389±8	283	63±5	266	129±8	283	459±10
Spring	476	1469±37	3679+113	4460±131	396±6	362	59+4	341	145±7	362	468±8
Summer	403	1374±38	3523±114	4095±132	381±6	291	59±4	271	135±7	291	457±8
Autumn	417	1364±42	3399±124	3924±144	354±7	340	62±4	306	129±7	340	449+8
Parity:											
1st	424	1118±150	3416±409	3518±476	286±26	412	76±15	327	100±20	412	386±26
2nd	410	1454±94	3781±258	4034±299	315±16	349	70±9	347	106±14	349	405±16
3rd	344	1540±49	3827±142	3474±165	355±8	241	62±5	241	123±8	241	436±10
4th	223	1483±52	3653±150	4319±174	388±9	147	59±6	144	130±9	147	458±11
5th	132	1468±94	3524±258	4528±300	440±16	77	43±10	76	152±15	77	502±18
≥6th	113	1382±163	3043±444	4331±516	495±28	50	55±16	49	194±24	50	560±27

Means underlined are the highest means for milk yield and LP and the lowest mean for DP, DO and CI.

TABLE 6 . Least-squares means and standard errors of age-at-calving classes in different parities for different traits studied (Model 1) .

Age-classes within parity (months)	90DY(kg)		305DY(kg)	TY(kg)	LP(days)	DP(days)		DO(days)		CI(days)	
	No	Mean±SE	Mean±SE	Mean±SE	Mean±SE	No	Mean±SE	No	Mean±SE	No	Mean±SE
1st parity :											
24	54	1004±174	3233±474	3513±550	312±30	53	86±18	36	138±24	53	419±30
27	168	1088±159	3342±432	3491±502	296±28	160	78±16	126	115±20	160	394±27
30	148	1194±149	3481±406	3619±471	285±26	147	77±15	120	106±20	147	386±26
33	54	1185±144	3608±393	3450±457	252±25	52	63±15	45	43±22	52	345±26
2nd parity :											
34	12	1213±161	3549±436	4075±507	357±28	10	90±18	9	147±30	10	449±30
37	83	1551±116	3829±316	4353±367	348±20	75	83±12	75	156±18	75	448±20
40	144	1496±102	3826±280	4192±325	332±18	123	76±10	122	134±16	123	426±18
43	119	1539± 97	3875±268	4127±311	305±17	99	65±10	99	91±15	99	391±17
46	29	1321±109	3363±300	3266±348	269±19	24	72±11	24	50±18	24	351±20
49	23	1602±109	4247±300	4191±348	280±19	18	35±12	18	61±20	18	365±20
3rd parity :											
45	10	1423±143	3420±389	4176±452	381±25	7	102±16	7	202±26	7	499±27
48	48	1619± 84	3937±233	4665±271	385±14	34	86± 9	34	188±15	34	497±16
51	87	1581± 66	3854±185	4479±216	371±11	63	68± 6	63	148±11	63	458±12
54	112	1532± 59	3816±167	4326±194	356±10	77	59± 6	77	121±11	77	434±12
57	54	1510± 65	3881±183	4296±213	340±11	36	60± 7	36	102±13	36	420±13
60	15	1600±1041	3795±285	4363±331	351±18	12	25±11	12	61±19	12	380±20
63	18	515±102	4086±281	4313±327	300±18	12	33±12	12	38±21	12	366±21

TABLE 6 . (Cont.)

		90DY(kg)	305DY(kg)	TY(kg)	LP (days)	DP(days)		DO(days)		CI(days)	
	No	Mean±SE	Mean±SE	Mean±SE	Mean±SE	No	Mean±SE	No	Mean±SE	No	Mean±SE
4th parity:											
61	43	1625±66	4039±186	5020±216	441±11	32	75±7	32	201±13	32	516±13
64	65	1457±59	3733±167	4408±195	406±10	43	67±7	42	172±12	43	492±13
66	57	1466±65	3777±182	4623±212	413±11	34	58±8	33	171±13	34	493±14
69	29	1383±87	3178±240	3760±279	356±15	16	63±11	15	112±18	16	434±19
72	16	1581±111	3686±305	4196±354	370±19	13	48±12	13	84±20	13	430±21
75	13	1385±129	3504±352	3906±409	340±22	9	42±15	9	43±24	9	385±26
5th parity:											
70	13	1528±122	3924±334	5235±388	489±21	10	46±14	10	221±23	10	545±24
73	27	1453±101	3519±278	4663±323	469±17	20	54±12	20	205±18	20	540±20
76	29	1404±106	3333±292	4372±339	433±18	14	44±13	14	159±20	14	497±23
79	28	1570±114	3800±312	4844±363	451±20	15	32±14	14	143±21	15	481±24
82	13	1446±148	3358±402	4269±467	421±26	18	39±16	7	105±28	18	449±27
85	22	1408±144	3212±393	3786±457	376±25			11	77±26		
6th parity:											
86	29	1482±135	3648±368	4970±428	510±23	18	57±15	18	227±22	18	573±26
88	18	1378±163	3011±442	4359±514	497±28	32	52±19	7	209±30	32	548±32
91	12	1479±187	3414±508	4676±590	477±33			7	184±31		
94	14	1440±199	2688±540	3524±627	420±35			6	96±33		
97	12	1277±201	2870±545	4334±633	531±35			7	263±33		
≥100	28	1240±222	2629±601	4124±698	538±39			4	187±39		

Year of calving

Results given in Table 5 (Model 1) reveal a general trend indicating that there was an increase in milk yield and DP (along with a decrease in LP, DO and CI) with advance of year of calving. This trend represents mainly an improvement in the strategies of management and feeding rather than genetic changes, since the effect of cow was accounted for in the model of the statistical analysis.

Year of calving constituted a significant ($p < 0.05$ or $P < 0.001$) source of variation in all traits with the exception of DP (Table 3). These results are generally in agreement with those results of many investigators working on Friesian cattle in Egypt (*e.g.* Ashmawy, 1975; Badran, 1978; Abdel - Glil, 1985; Mohamed, 1987; Khattab and Ashmawy, 1988; El-Sedafy, 1989).

Season of calving

Season of calving had a significant ($P < 0.01$ or $P < 0.001$) effect on 90DY, TY and LP, while it had no significant effect on 305DY, DP, DO and CI (Table 3). Similar results were shown by some Egyptian studies on Friesian cattle (*e.g.* Badran, 1978; Abdel-Glil, 1985; Mohamed, 1987; Khattab and Ashmawy, 1988; El-Sedafy, 1989).

Spring-calvers recorded the highest milk yield with the longest LP (along with the shortest DP) compared to the other seasons (Table 5). These findings are in agreement with those of some Egyptian studies on Friesian cattle (*e.g.* Mohamed, 1987; khattab and Ashmawy, 1988), but in disagreement with others (*e.g.* Badran, 1978; Abdel-Glil, 1985; El-Sedafy, 1989). Autumn-calvers recorded the shortest DO and CI compared to those cows calved in other seasons. Most Egyptian studies on Friesian cattle (*e.g.* Badran, 1978; Mohamed, 1987; El-Sedafy, 1989) reported similar results. Findings of the present study could be explained on the basis that cows calving in spring will be in lactation during summer, autumn and winter where green fodder will be available and weather become milder during most days of the lactation period.

Year of season of birth

As shown from model 4, AFC of imported or locally-born heifers was influenced ($P < 0.01$ or $P < 0.001$) by year and season of birth (Table 4). Some studies on Friesian cattle in Egypt (*e.g.* El - Sedafy, 1989) confirmed these results, while the present results disagree with findings of Badran (1978), Abdel-Glil (1985) and Mohamed (1987).

Summer-born heifers (imported or locally-born) calved for the first time at younger age than those born in other seasons of the year (Table 4). Badran (1978) and Abdel-Glil (1985) stated that summer-born heifers or autumn-born ones calved for the first time at younger age than those born in other seasons of the year.

Parity

Least-squares means given in Table 5 (Model 1) show that milk yield traits and LP are curvilinearly affected by parity. DP tends to decrease with the increase of lactation number up to the 5th and increased thereafter. Among the successive parities, the first had the lowest means of LP, DO and CI along with the longest DP. A similar trend was observed by many investigators (*e.g.* Louca and Legates, 1968; Ruvuna *et al* 1984; Mohamed, 1987; Khattab and Ashmawy, 1988; Soliman and Khalil, 1989). DO and CI increased linearly as parity advanced up to the 6th (Table 5).

F-ratios given in Table 3 indicate that parity was one of the most important non-genetic factors influencing ($P < 0.05$ or $P < 0.001$) yield traits, LP, DO and CI. Results of the present and reviewed studies (*e.g.* Ruvuna *et al.*, 1984; Arafa, 1987; Mohamed, 1987; Khattab and Ashmawy, 1988; Soliman and Khalil 1989) lead therefore to conclude that adjustment of lactation records for lactation number is recommended.

Age at calving

No consistent pattern for the significance of age at calving on yield traits and DP (Model 1) were observed, while significant effects ($P < 0.01$ or $P < 0.001$) on LP, DO and CI were evidenced (Table 3). Consequently, adjustment of LP for age at calving within parity is practically recommended for commercial herds in Egypt. Similarly, Janson (1980) reported that differences in ages at calving of each separate lactation were significant for LP, DO and CI. Also, the clear differences between most least-squares means of lactation traits for different ages (Table 6) indicate the need to adjust lactation yield (90DY, 305DY and TY) for age at calving within parity.

No consistent trend for the effect of age of cow within each lactation on milk yield traits was obsreved (Tables 6 and 7). The partial linear regression coefficients of LP and DP on age at calving in the first five lactations were significant ($P < 0.001$), *i.e* significant linear relationships between LP of DP and age at calving within parity were generally observed. However, most partial linear regressions on age at calving within parity reflect a decrease in LP and DP as age of cow at calving advanced (Tables 2 & 7). At the 6th parity, length of LP increased in a quadratic manner as age of cow advanced (Table 7). Hansen *et al.* (1983), Ruvuna *el al.* (1984) and Soliman *et al.* (1989) reported that milk yield within parity usually increased linearly with advancing of age of cow till a maximum production was attained at a certain parity and declined linearly (within parity) thereafter. However, maximum 90DY, 305DY and TY milk yield were attained at 60, 48 and 86 months of age across all lactations, respectively.

A significant linear relationships between CI or DO and age at calving within parity (in the first five lactations) were generally obtained (Table 7). This means that DO and CI decreased in a linear manner as age of cow (within each parity) advanced (Table 6). Older cows within each parity had shorter DO and CI than younger ones (Table 6). This trend indicates that reproductive efficiency of the cow improved slightly as the cow got older and this is in agreement with Everett *et al* (1966), Basu and Ghai (1980), Janson (1980) and Hillers *et al* (1984). Poor fertility (*i.e.* long Do and CI) appeared for different ages within the 5th and 6th parity (Table 6) a reflection of lactation stress. Hillers *et al* (1984) reported that older cows (*i.e.* later lactations) had longer DO than younger ones.

Days open

F-ratios presented in Table 8 (Model 2) indicate that DO is one of the most important factors influencing ($P < 0.001$) 305DY, TY, LP, DP and CI, but constituted a non-significant effect on 90DY. The wide differences in least-squares means for milk yield obtained in the present study for different DO classes lead also to conclude that it is necessary to adjust milk traits in commercial herds in Egypt for DO. Most of the Egyptian studies and the non-Egyptian ones (e.g. Smith and Legates, 1962; Mohamed, 1987; Khattab and Ashmawy, 1988; Soliman and Khalil, 1989; Soliman *et al.*, 1989) showed that DO effects were of some importance in influencing milk yield, LP and DP. Other studies (Everett *et al.*, 1966; Basu and Ghai, 1980) reported also that DO was strongly positively correlated with CI ($P < 0.01$). Consequently, variation in length of CI may be due to the fluctuation in length of DO.

305DY, TY, LP and DP increased in a curvilinear ($P < 0.001$) relationship with the increase of DO (Table 8) . This trend was confirmed by many other

TABLE 7 .Estimates of polynomial regression analysis (b) of traits studied (model 1) on age at calving in different parities

Lactation number & trait	Partial polynomial regression coefficient of the		
	Linear (unit/month)	Quadratic (unit/month^2)	Cubic (unit/month^3)
	b±SE	b±SE	b±SE
1st parity :	23.7±9.9**	-2.49±2.61	-0.85±1.01
90DY (kg)	42.6±2.7	0.52±7.1	-0.27±2.74
305DY (kg)	3.7±3.2	-3.79±8.19	-2.76±3.18
TY (kg)	-6.1±1.8***	-0.46±0.46	-0.16±0.18
LP (days)	-2.1±1.1	- 0.13±0.30	- 0.13±0.11
DP (days)	-6.9±1.8***	- 0.41±0.49	- 0.30±0.18
CI (days)	-8.8±1.9***	-1.12±0.55*	-0.42±0.21*
DO (days)			
2nd parity :	3.1±7.6	-0.93±1.40	0.77±0.31**
90DY	10.0±20.6*	1.04±3.78	1.51±0.84
305DY	-39.8±23.8	-0.13±4.39	1.88±0.98*
TY	-6.8±1.3***	1.13±0.25	8.44±5.54
LP	-3.0±0.9***	-0.13±0.16	-0.03±0.04
DP	-8.3±1.4***	0.05±0.27	0.12±0.06*
CI	-9.1±1.5***	-0.01±0.28	0.16±0.06**
DO			
3rd parity :	-3.7±7.2 *	-8.81±1.00	0.22±0.19
90DY	9.6±19.4	0.43±2.70	0.60±0.52
305DY	-18.4±22.5.	0.71±3.14	0.58±0.60
TY	-4.5±1.3***	-0.12±0.18	-0.01±0.01
LP	-3.6±0.8***	0.07±0.12	-0.02±0.02
DP	-8.2±1.3***	0.04±0.19	0.002±0.04
CI	-9.5±1.3***	0.03±0.19	-0.01±0.04
DO			

TABLE 7 .Con.

4th parity :			
90DY	-11.6±8.8*	2.32±1.54	−0.54±0.39
305DY	-45.0±23.6*	5.44±4.18	0.48±1.00
TY	-83.1±27.4**	6.01±4.85	0.05±1.23
LP	-7.3±1.5**	0.16±0.27	0.01±0.06
DP	-2.2±1.0*	0.03±0.18	-0.02±0.05
CI	-8.9±1.7***	-0.26±0.31	0.02±0.08
DO	-11.0±1.6***	-0.35±1.65	0.02±0.08
5th parity :			
90DY	-2.4±8.5	-0.42±1.55	-0.52±0.39
305DY	-26.3±22.9	-0.23±4.18	-1.82±1.05
TY	-68.0±26.6**	-2.30±4.85	-2.54±1.22*
LP	-6.5±1.5***	-0.21±0.27	-0.11±0.06
DP	-1.5±1.2**	-0.01±0.30	0.11±0.09
CI	-8.8±2.0***	-0.22±0.50	0.08±0.15
DO	-10.0±1.7***	-0.05±0.33	0.02±0.08
>6th parity :			
90DY	-16.0±9.0	-1.28±1.83	-0.19±0.56
305DY	-59.4±24.2***	3.46±4.92	-0.82±1.51
TY	-47.3±28.1	9.70±5.71	-0.12±1.75
LP	2.5±1.6	1.34±0.32***	-0.04±0.09

*P<0.05; **P<0.01; ***P<0.001 .

reviewed studies (Louca and Legates, 1968; Schaeffer and Henderson, 1972; Mohamed, 1987; Khattab and Ashmawy, 1988; Soliman and Khalil, 1989; Soliman *et al.*,1989). Smith and Legates (1962) attributed this trend to the competition between milk production of the cow and the nutrition of her fetus especially with the beginning of the 5th month of pregnancy. They also explained such relationship by the fact that milk-secretion hormones decrease with the advance of stage of pregnancy.

Length of CI increased in a curvilinear fashion (P < 0.001) with advance of DO (Table 8). An evidence was given by Badran (1978) and Mohamed (1987) for Friesian cattle in Egypt.

Preceding dry period (PDP)

Milk yield traits and LP (Model 3) increased considerably (P < 0.05 or P <

0.001) with the increase of length of PDP (Table 8). Results of polynomial regression analysis given in Table 9 confirmed such linear relationship between preceding dry period and milk traits of subsequent lactations. This trend which was also reported by Smith and Legates (1962), Ashmawy (1975) and Arafa (1987) could be attributed to that longer PDP enables the cow to replenish her body and to restore the minerals which may have been depleted through the lactation period. On the other hand, PDP had non-significant effects on both DO and CI (Table 8). Means for DO and CI with different PDP classes did not show any specific trend (Tables 8 & 9). Results of Smith and Legates (1962), Louca and Legates (1968), Schaeffer and Henderson (1972), Camoens *et al* (1976b) and Hillers *et al* (1984) showed that there is no relationship between current days dry and subsequent open period. Mohamed (1987) found that each month increase in PDP resulted in an increase of 2.3 days in CI. Findings of Camoens *et al* (1976b) and Basu and Ghai (1980) showed that PDP was positively correlated with CI ($P < 0.05$ or $P < 0.01$).

The mode of PDP in this study is 60 days (Table 8). The highest average of milk yield and LP were recorded when PDP was 100-119 days for 90DY and >160 days for 305DY and TY. Schaeffer and Henderson (1972) and keown and Everett (1986) noticed that optimum number of preceding days dry for obtaining maximum production in the subsequent lactation ranged between 50 to 60 days. Khattab and Ashmawy (1988) also reported that PDP of approximately 60 days gave the highest average of milk production in the subsequent lactation.

Interactions

Interaction between herd and year of calving was significant ($P < 0.01$ or $P < 0.001$) for most traits studied (Table 3). Camoens *et al* (1976a) and El-Sedafy (1989) reported similar results. The interaction between herd and season of calving was also significant ($P < 0.05$ or $P < 0.01$ or $P < 0.001$) for 90DY, 305DY, TY, LP, DO and CI, while it was non-significant for DP (Table 3). These results were generally agree with findings of Camoens *et al* (1976a). Moreover, 90DY, 305DY, TY, LP and DP were affected ($P < 0.01$ or $P < 0.001$) by interaction between year and season of calving. These results are generally in agreement with those reported by Ruvuna *et al* (1984), while Camoens *et al* (1976a) reported opposite findings.

TABLE 8 .Least-squares means (and their standard errors) and tests of significance of days open (Model 2) and preceding dry period (Model 3) affecting different traits .

Independent variable	No	90DY(Kg) Mean±SE	No	305DY (Kg) Mean±SE	TY (Kg) Mean±SE	LP (days) Mean±SE	DP (days) Mean±SE	No	CI (days) Mean±SE	DO (days) Mean±SE
Days open+ :		(F=0.98ns)		(F=5.2***)	(F=15.02***)	(F=102.5***)	(F=9.17***)		(F=579.3***)	
40-59	81			3405±159	3470±179	265±6	55±5	81	321±3	
60-79	243			3535±127	3628±142	276±4	66±3	243	344±2	
80-99	244			3793±128	3898±143	296±4	65±3	244	362±2	
100-119	207			3857±131	4005±146	311±4	67±3	207	379±2	
120-139	110			3928±147	4137±165	327±5	70±4	110	398±3	
140-159	83			3978±151	4253±169	346±5	73±4	83	419±3	
160-179	53			4260±182	4707±205	371±7	72±6	53	443±4	
180-199	45			4158±183	4962±206	381±7	81±6	45	463±4	
≥200	118			4034±150	5074±168	425±5	104±4	118	531±3	
Preceding dry period+ :		(F=2.34*)		(F=5.0***)	(F=5.64***)	(F=4.76***)			(F=0.35ns)	(F=0.99ns)
20-39	49	1413±70	41	3978±236	4285±267	323±9		41	399±4	173±14
40-59	158	1515±54	92	4094±205	4382±231	336±7		92	401±4	166±11
60-79	3403	1555±47	239	4457±187	4822±211	345±6		239	401±3	170±10
80-99	13	1598±48	242	4475±186	4871±210	351±6		242	401±3	168±10
100-119	148	1626±54	102	4735±202	5146±229	354±7		102	399±3	168±11
120-139	77	1600±60	59	4532±211	4965±239	356±7		59	400±4	161±12
140-159	41	1481±75	24	4569±267	4946±302	367±10		24	401±5	147±16
≥160	56	1579±67	29	5110±263	5630±297	379±10		29	395±5	137±16

+F-ratios of test of significance are given in paranthes s;
nsNon-significant (P>0.05);***P<0.001 .
Means underlined are the highest for milk yield, LP and DP .

TABLE 9 . **Estimates of polynomial regression analysis (b) of different traits on preceding dry period (Model 3) .**

	Partial polynomial regression coefficient of the third degree		
	Linear (unit/ month)	Quadratic (unit/month^2)	Cubic (unit/month^3)
Trait	b±SE	b±SE	b±SE
90DY (kg)	0.85±0.40*	-0.025±0.008	0.00043±0.00022
305DY (kg)	4.11±1.11***	-0.037±0.023	0.00044±0.00059
TY (kg)	5.39±1.24***	-0.059±0.027	0.00043±0.00066
LP (days)	0.21±0.06***	-0.003±0.001	0.00003±0.00003
CI (days)	- 0.16±0.08	-0.003±0.002	-0.00003±0.00004

*P<0.05, ***P<0.001 .

Conclusion

(1) Higher milk yield (with long lactation period) was produced by locally-born Friesian cows compared to that of imported Friesian ones. On the other hand, reproductive efficiency of locally-born cows was lower than that of imported ones. Age at first calving of locally-born daughters was not significantly lower from that of their imported Friesian dams.

(2) For lactation traits, days-open effect was the most important non-genetic factor, followed by parity. Therefore, these effects should be considered in any programme for sire evaluation for lactation and female fertility of Friesian cattle. Correction of lactation records for age at calving, days open and lactation length is consequently recommended. Schaeffer and Henderson (1972) and Soliman *et al* (1989) concluded that adjusting of milk records for age at calving and/or days open appears necessary and would not introduce genetic biasness.

Acknowledgement

The authors are grateful to professor E. S. E. Galal, Department of Animal production, Faculty of Agriculture, Ain Shams University, Cairo, Egypt for helpful comments and for reading the manuscript.

References

Abdel-Glil, M. F. (1985) Genetic improvement in milk yield in a herd of Friesian cattle. *M. Sc. Thesis,* Fac. Agric., Zagazig Univ., Banha Branch, Moshtohor, Egypt.

Arafa, S. A. (1987) The effect of crossing Egyptian cattle with exotic breeds on some production traits. *M. Sc. Thesis,* Fac Agric., Zagazig Univ., Banha Branch, Moshtohor, Egypt.

Ashmawy, A. A. (1975) The relationship between dry period and milk production in dairy cattle. *M. Sc. Thesis,* Faculty of Agric., Ain Shams University, Cairo, Egypt.

Badran, M. H. (1978) Productive and reproductive performance of Friesian cattle under the conditions prevailing at the Northern Tahreer. *Ph. D. Thesis,* Fac. Agric., Al-Azhar Univ., Egypt.

Basu, S. B. and Ghai, A. S. (1980) Studies on inheritance of some reproductive traits and relationship with milk production in cross-bred dairy cattle. *Indian J. Anim. Sci.,* **50** (2): 119.

Camoens, J. K.; McDowell, R. E.; Van Vleck, L. D. and Rivera Anaya, J. D. (1976a) Holsteins in Puerto Rico: I. Influence of herd, year, age and season on performance. *J. of Agriculture of the University of Puerto Rico.,* **4:** 526.

Camoens, J. K.; McDowell, R. E.; Van Vleck, L. D. and Rivera Anaya, J. D. (1976b) Holsteins in Puerto Rico: II. Influence of lactation length, days dry, days open and calving interval on production traits. *J. of Agriculture of the University of Puerto Rico.,* **4:** 540.

El-Sedafy, E. R. M. (1989) Some reproductive and productive parameters in Friesian cattle in Egypt. *M. Sc. Thesis,* Fac. Agric., Ain Shams Univ., Cairo, Egypt.

Everett, R. W.; Armstrong, D, V. and Boyd, L. J. (1966) Genetic relationship between production and breeding efficiency. *J. Dairy Sci.,* **49:** 879.

Hansen, L. B.; Freeman, A. E. and Berger, P. J. (1983) Variance, repeatabilities and age adjustments of yield and fertility in dairy cattle. *J. Dairy Sci.,* **66:** 281.

Harvey, W. R. (1987) *User's Guide for LSMLMW. Mixed model least squares and maximum likelihood computer program.*, PC-1 Version, Ohio Stat University, Columbus, (Mimeograph), USA.

Hillers, J. K.; Senger, P. L.; Darlington, R. L. and Fleming, W. N. (1984) Effects of production, season, age of cow, days dry and days in milk on conception to first service in large commercial dairy herds. *J. Dairy Sci.*, **67:** 861.

Janson, L. (1980) Studies of fertility traits in Swedish dairy cattle. I. Effects of non-genetic factors. *Acta Agric. Scand.*, **30:** 109.

Keown, J. F. and Everett, R.W. (1986) Effect of days carried calf, days dry and weight of first calf heifers on yield. *J. Dairy Sci.*, **96:** 1891.

Khattab, A. S. and Ashmawy, A. A. (1988) Relationships of days open and days dry with milk production in Friesian cattle in Egypt. *J. Anim. Breed.* Genet., **105:** 300.

Louca, A. and Legates, J. E. (1968) Production losses in dairy cattle due to days open. *J. Dairy Sci.*, **51:** 573.

Mohamed, S. S. (1987) Milk and production as affected by calving interval and service period in purebred and crossbred Friesian cows in Egypt. *M. Sc. Thesis,* Fac. Agric., Ain Shams Univ., Cairo, Egypt.

Ragab, M. T.; Abdel-Aziz, A. S. and Morad, H.M. (1973) Phenotypic and genetic parameters of some productive traits in a herd of Friesian cattle at the Tahreer Province. *Egyptian J. Anim. Prod.*, **13** (1): 1.

Ruvuna, F.; Mao, I. L.; McDowell, R. E. and Gurnani, M. (1984) Environmental and genetic variation in milk yield of Native cattle and crosses with Brown Swiss in India. *J. Anim. Sci.*, **59:** 74.

Schaeffer, L. R. and Henderson, C. R. (1972) Effects of days dry and days open on Holstein milk production. *J. Dairy Sci.*, **55:** 107.

Smith, J. W. and Legates, J. E. (1962) Relation of days open and days dry to lactation milk and fat yields. *J. Dairy Sci.*, **45:** 1192.

Soliman, A. M. and Khalil, M. H. (1989) Milk protein as a breeding objective in Braunvieh cattle breeding. *Third Egyptian-British Conference on Animal, Fish and Poultry Production,* Alexandria, 7-10 October, 1989., pp 301. Egypt

Soliman, A. M., Ashmawy, A. A., Khalil, M. H. and Essl, A. (1989) Analysis of milk production traits of Pinzgauer cattle in Austria. I. Non-genetic factors. *J. Animal Breeding and Genetics.,* **106:** 423.

تقييم الابقار الفريزيان المستوردة والمولودة محليا تحت ظروف المزارع التجارية فى مصر

١ ـ النماذج الاحصائية والعوامل غير الوراثية

عزت عطا عفيفى[١]، ماهر حسب النبى خليل[٢]، محمود أحمد سالم[٣]

١ ـ قسم الانتاج الحيواني ـ كلية الزراعة بمشتهر ـ جامعة الزقازيق

٢ ـ الجمعية العامة لتنمية الثروة الحيوانية ومنتجاتها ـ الدقى ـ القاهرة ـ مصر .

أجرى تحليل لدراسة انتاجية الابقار فى قطيعين من قطعان الفريزيان التجارية أحدهما فى مزرعة مشال بمحافظة الغربية والثانى فى كومبرة بمحافظة الجيزة والتابعة للجمعية العامة لتنمية الثروة الحيوانية بإستخدام سجلات ١٦٤٦ موسم ادرار حيث تم تجميع بياناتها خلال الفترة من ١٩٨١ حتى ١٩٨٨ . شملت الدراسة صفات إنتاج اللبن خلال ٩٠ يوم ـ خلال ٣٠٥ يوم ـ خلال موسم الإدرار كله بالإضافة إلى صفات فترة الإدرار ـ فترة الجفاف ـ العمر عند أول ولادة ـ فترة الأيام المفتوحة ـ الفترة بين ولادتين .

كانت متوسطات هذه الصفات على التوالى فى ١٥٠٣ كجم ـ ٣٨٣٨ كجم ـ ٤٠٢٨ كجم ـ ٣٠٤ يوما ـ ٦٩ يوما ـ ٢٧.٥ شهرا ـ ١٠٠ يوما ـ ٣٨١ يوما . كان تأثير القطيع معنويا على مستوى ٥٪ و ١٪ على انتاج اللبن خلال ٣٠٥ يوما خلال موسم الادرار كله وفترة الجفاف وفترة الايام المفتوحة فقط . أعطت أبقار محطة مشال أعلى إنتاج من اللبن خلال ٣٠٥ يوما ـ خلال موسم الإدرار كله وكذلك سجلت أطول فترة جفاف وأقصر فترة للإدرار وللأيام المفتوحة وللفترة بين ولادتين مقارنة إلى أبقار محطة كومبرة . سجلت الأبقار المولودة محليا أعلى إنتاجا للبن خلال ٩٠ يوم وخلال موسم الإدرار كله وأطوال فترة للادرار والايام المفتوحة وللفترة بين ولادتين بالإضافة إلى أقصر فترة جفاف مقارنة بالأبقار المستوردة فى محطة مشال ، أما فى محطة كومبرة كانت الأبقار المستوردة أعلى إنتاجا للبن خلال ٩٠ يوما و ٣٠٥ يوما من الابقار المولودة محليا بينما سجلت تلك الأبقار أقصر فترة للإدرار وللجفاف والأيام المفتوحة وللفترة بين ولادتين . كان لكل من سنة وموسم الميلاد تأثيرا معنويا على عمر البقرة عن أول ولادة وذلك للابقار المستوردة أو المولودة محليا . أعطت العجلات المولودة بالصيف مولودها الأول فى عمر مبكر عن مواليد المواسم الأخرى . أعطت العجلات المولودة التى ولدت فى الربيع أعلى إنتاج للبن وأطول فترة للإدرار مع أقصر فترة للجفاف مقارنة بتلك التى ولدت فى المواسم الأخرى . تأثر كل من محصول اللبن وفترة الإدرار تأثيرا معنويا بترتيب موسم الإدرار حيث كانت العلاقة فى شكل خط منحنى بينما تناقصت فترة الإدرار معنويا بزيادة ترتيب موسم الإدرار حتى الموسم الخامس ثم تزايدات بعد ذلك . تزايدت خطيا كل من فترة الأيام المفتوحة والفترة بين ولادتين معنويا بتقدم ترتيب موسم الإدرار حتى الموسم السادس . لم يكن هناك إتجاه محدد لتأثير عمر البقرة داخل موسم الإدرار على صفات إنتاج اللبن ، بينما تناقصت طول كل من فترة الإدرار والجفاف والأيام المفتوحة والفترة بين ولادتين تناقصا خطيا بتقدم عمر البقرة داخل موسم الإدرار . تزايدت صفات إنتاج اللبن وكل من فترة الادرار والجفاف والفترة بين ولادتين زيادة معنوية حيث وجد ان هناك علاقة فى صورة خط منحنى لتلك الصفات بزيادة فترة الأيام المفتوحة . تزايدت صفات إنتاج اللبن وفترة الإدرار زيادة محسوسة معنوية بزيادة فترة الجفاف السابقة لموسم الإدرار بينما لم تتأثر فترة الايام المفتوحة والفترة بين ولادتين معنويا بذلك . هذا وقد سجل أقصى إنتاج للبن مصحوبا بأطول فترة إدرار عندما كان يسبق موسم الحليب فترة جفاف يتراوح طولها بين ١٠٠ يوم الى ١٦٠ يوما