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THE EFFECT OF AGE AT FIRST CALVING ON PRODUCTIVE LIFE AND LIFETIME PROFIT IN LACTATING EGYPTIAN BUFFALOES

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ABSTRACT

Data on Egyptian buffalo were analyzed to estimate the effect of age at first calving (AFC, mo) classes on some productive traits [milk yield (MY, kg), milk yield per day, (MY/D, kg), and lactation period (LP, d) and reproductive traits [calving interval (CI, d) and number of services per conception (NSPC, count). Means for AFC were 916±41, 1143±72 and 1414±119 days for early, average and late respectively. Additionally, means of milk yield (MY) for mentioned three levels of AFC were 1780±774, 1920±607 and 2040±812 kg, respectively.

Economic evaluations indicated that the profit per buffalo cow during the lifetime production were L.E 62960 ($3778), L.E 38538 ($2312) and L.E 3695 ($222) of early, average and late AFC, respectively. Reducing AFC was a positive influence on lifetime profit per buffalo cow. Lifetime profit rises to about L.E 24400, L.E 59200, and L.E 34800 when AFC decreased to 30 months from (38 months), to 30 months from (55 months) and to 38 months from (55 months), respectively. Heritability estimates for MY, MY/D, LP, CI, NSPC and AFC were 0.39±0.09, 0.31±0.07, 0.21±0.08, 0.15±0.06, 0.11±0.07 and 0.57±0.18, respectively. Genetic correlations between AFC and MY, MY/D, LP, CI, NSPC were -0.146±0.33, -0.382±0.30, +0.038±0.47, +0.530±0.49 and +0.311±0.63, successively. The present results revealed that the buffaloes having late AFC were unprofitable during her productive life in the farm, but still needs further investigation of large data with different geographical area and management conditions.

Keywords: *Bubalus bubalis*, buffaloes, age, calving, Egyptian buffaloes, profitable, genetic, number service per conception

INTRODUCTION

Buffalo is one of more important livestock species contributing towards food security of the peoples. Also it is the major dairy animal in Egypt, contributing the majority of the total milk produced in the Egypt (IFCN, 2009). The age at first calving (AFC) has a huge influence on profitability in any dairy projects and used as a good indicator of herd's reproductive performance. Ettema and Santos, (2004) noticed that the AFC is an important factor in decreasing cost of rearing

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replacement heifers in dairy farms. Heifers, although they future herd, but are nonproductive and thus a financial burden on the dairy herd investment unto they begin lactating. The cost incurred on feeding, management and housing represents 15 to 20% of the total costs associated with to milk yield according to (Heinrichs, 1993) and /or 9 to 20% of the total cost of the farm according to (Mourits et al., 1999; Bailey, and Currin, 2009), also recorded for production as second highest expense, next to the nutrition cost (Heinrichs, 1993; Mourits *et al*., 1999; Bailey and Currin, 2009). As stated by Bagnato and Oltenacu (1993) milk production and fertility are the essential factors that impact on the profitability of milk herds. The optimum AFC in buffaloes is a result in the interplay between different factors such as genetic (Mahdi Elahi Torshizi, 2016), nutritional (Bhatti *et al*., 2007), environmental (Chiaia *et al*., 2015) and managemental (Marshall *et al*., 2013). The advantages of reducing AFC were lower overhead expense, feed costs decrease with the increase in milk yield for the herd (Lin *et al*., 1988 and Goodger *et al*., 1989). Nevertheless, over there negative effects of higher and lower estimations of AFC (than optimum AFC) on longevity and milk yield traits (Thompson *et al*., 1983 and Simerl *et al*., 1992). Although younger calving may be effect on first lactation and not effect on health, future lactation and longevity as long as first calf heifers are freshen at a suitable weight.

For enhance the productive in dairy animal, it is essential to develop a comprehension of the factors influencing its reproduction and production (Afzal *et al*., 2007). Lactation length and milk production (as production traits) and number service per conception and calving interval (as reproductive traits) consider a four important traits in dairy cattle, based on each genetic and environmental factors. The profitability increases with increase milk yield and based on that dwindling the rearing expenses of dairy animals (Zafar *et al*., 2008). High milk production plays the great role in this aspect. And great economic importance under Egyptian environments where there is a large variability in terms of feed quality and quantity feed effect in developing productive and reproductive traits. The possible genetically improved in a trait depends on its genetic and phenotypic associations with other traits and on some other genetic parameters. Genetic improvement can be achieved through selection. The fixed effects such as month and year of calving and parity etc. as well as effect on productive and reproductive traits, and need to be evaluated in a production raised. AFC is an important parameter of reproductive efficiency. The shorter AFC, the longer will be the productive life (Naqvi and Shami, 1999).

On account of the high expenses of keeping farm animals, having rates depressed of reproductive performance and long generation intervals, as come about with buffalo, the population genetic parameters like heritability, genetic and phenotypic correlations have great importance (Gupta *et al*., 2015). The information for these parameters of every characteristic for economic consequence is required as they are necessary for planning, activation and appreciation of genetic improvement programmers. Against this background, this study aimed to evaluate the impact of age at the first calving on the economic return (profitability) of the Egyptian buffaloes during the length of productive life. The previous studies also will help to formularize appropriate evaluation measures explicitly in organized farms and the field for improving economic traits of this buffaloes.

MATERIALS AND METHODS

The study was based on data collected from history sheets of the lactating Egyptian buffalo cows maintained at the farms of the Mehallet Mousa Station of the Animal Production Research Institute (APRI), Ministry of Agriculture, Egypt. All available data on production and reproduction performances (1391 records, spread over 17 years, 2000 to 2016) were recorded.

Buffaloes were kept under semi-open sheds. Lactating buffaloes were milked by hand or machine twice daily, through the lactation length, and daily milk yield was recorded during milking. Buffaloes were maintained under the same system of feeding and management in the farms according to (El-Awady *et al*., 2016). Traits studied are productive traits as milk yield (MY, kg), milk yield per day, (MY/D, kg), Lifetime milk yield (LTMY, kg) and lactation period (LP, d) and reproductive traits such as calving interval (CI, d), number of services per conception (NSPC, count) and Age at first calving (AFC, days).

Age at first calving and profitability via buffaloes cows profitability data. These profit estimations take into a declaration rearing expenses, earnings and buffalo cow cost. A cut-off for eight to thirteen years of age was utilized as it demonstrated to capture every buffalo cow's ability to survive from multiple cycles of reproduction, health, functional conformation and production - an imperative feature when looking at lifetime profitability in buffaloes. Lactation periods which have less than (100 d) and greater than (365 d) were removed, also, calving interval less than (340 d) and greater than (600 d) and as well, milk yield beneath 250 kg and above 3000 kg. After these explorative restrictions and cancellations relevant to every trait, it continued in the database knowledge of 1391 buffalo that offered calves from 2000 to 2016. On the basis of the recorded data of age at first calving and categorized into three levels, two level were extremes, level 1 (early AFC ≤30 months), level 3 (late AFC ≥55 months) and level 2 which was having the average (average AFC = 38 months). Lifetime milk yield (LTMY) was estimated as the total quantity of milk produced for a buffalo cow during the period it stayed in the herd, Longevity for the animals or herd life (HL) defined as the difference between the birth date and the date of culling, and productive life (PL) the sum of days from the first calving until last day in milk. The costs of raising and managing for heifers from birth to first freshen were calculated to determine the effect of that period on the profitability from animal. The prices and the costs were based on market and farm gate and were adopted as of 2015/2016. Gross margin is one of the great effective measures of estimating farm profitability (Barnard and Mix, 1993 and El-Awady, 2013). Thus, to compare between the three AFC levels, the deterministic model was utilized to determine the annual gross margin and benefit/cost ratio (current worth of benefits/current worth of costs) as economic parameters. For comparison between the three herds, the annual gross margins plus the discounted measurement and the benefit / cost ratio (the present value of benefits divided by the present value of the costs) were used as economic tools for the comparison between the three studied herds. Lifetime profit for each buffalo cow was calculated as follows:

Lifetime profit (LP) = Income (gross output) - Outcome (variable cost)

Data analysis

Least squares means and analysis of variance of fixed effects on traits under study were determine by Mixed Model program (Harvey, 1990). A linear model containing the fixed effects as month (12) and year (17) of calving and parity (12). While age at first calving was as a covariate in the first model and as a fixed classes in the second model to analyze the different studied traits. Annualized milk yield (AMY, kg equals TMY divided by calving interval, in days multiplied by 365).

Single and two-trait analyses were realized to MY, MY/D, LP, CI, NSPC and AFC traits using the animal model. Genetic parameters and breeding value of different studied traits were determine with REML procedures using the MTDFREML program (Boldman *et al*., 1995). The assumed model was:

$$Y = Xb + Z_a + e.$$

Where: Y = a vector of observations, b = a vector of fixed effects with an incidence matrix, a = a vector of the direct genetic effects, and e = the vector of residual effects. X and Z are incidence matrices relating records to fixed and direct genetic effects, respectively.

RESULTS AND DISCUSSION

General description

Means for different studied traits at three levels of AFC are present in Table 2. The present results showed that late AFC had poorer reproductive performance than others. Also, Table 2 reflected that buffalo cows those have longer interval from calving to the conception, had high milk production. Hence, this led to lengthen the calving interval consequence for increase number of services per conception by approximately 0.45 times (late vs. early AFC), 0.88 times (late vs. average AFC) and 0.43 times (early vs. average AFC). In India Verma *et al*. (2018) Murrah buffaloes, cleared that a calving interval of 400 days is feasible in buffaloes considering that a service period of 90 days and 310 days gestation period. If the calving interval is longer, the sum of calving's in her life will be decreased and also complete life milk production decrease.

The optimum service period (60 to 90 days) helps the animal to retrieve during the stress of calving and also to get back the normal reproductive cyclicity (Baruselli *et al*., 2001). Lifetime profit was estimated of individuals on the basis of milk income and production expenses including nutrition cost and operating expenses of herd which cleared that dissimilarities in management type according to herd size. Calculated economic values for income, expenses and profit by Egyptian pound (EGP). Locally, the abbreviation LE or L.E.

As shown in Table 2, for one lactation, animals having late AFC, although they were the highest in most studied traits (MY, MY/D, LP, CI and NSPC), they were the lowest in DP and AMY. In addition, for lifetime traits were also the lowest in NLC, LTMY and lifetime days in milk than another animals having early and Average AFC. The results showed that animals having early AFC producing MY, NLC more than having late AFC (about 2.04 times and 2.11 times, respectively) and more than having average AFC (about 1.67 times and 1.56 times, respectively) during their productive life.

Lifetime profit has been affected more by longevity (VanRaden, 2002). Productive life in the US was defined as the lactating period of a cow to 84 months, but credit for days in milk was restricted to the first 305 days of each lactation (VanRaden and Klaaskate, 1993; Pollott, 2011). Lifetime profits are susceptive to fluctuations and was less difference in animals of a relatively short longevity.

The difference between the present means and those found in other studies of dairy animals may be due to one or more of the following reasons 1) climatic and managerial conditions, 2) genetic and phenotypic various and 3) methods and/ or analysis models were used. Increased number services per conception prolongs the service period resulting in along calving interval which ultimately reduces the number lactations on lifetime basis (Khan *et al*., 1989). With the aim of improvement the reproductive performance in dairy animals, reduction in the number of services per conception is essential. This parameter has very low genetic variability (Basu, 1985), and it appears to be influenced by the environment. Lifetime profits are liable to fluctuation and had less dissimilarity for animals of a relatively short lifetime.

AFC and economic evaluation:

Estimated the economic values for income, costs, value of the animal itself, and profit in buffalo cow/year by currency EP (L.E) in three levels of AFC are provided in Table 3. Feeding represented the more important element for the variable expenses. It represented 96.00, 95.34 and 94.70% for early, average and late AFC, respectively in Table 3.

Annual variable cost per buffalo cow per year of late level of AFC was higher than those buffalo cows of early and average levels of AFC by about 10.26 and 5.47%, respectively, while average AFC was higher than early AFC by about 4.55%. This difference among three levels of AFC can be attributed to animal maintenance needed; the adjunctive feeding to cover excessive milk production, labor (workers), veterinary care and semen cost to insemination, while buffalo cows in late AFC required to more semen for pregnancy to occur.

Income (gross output) calculated as follows: 1) The number of lactation complete (NLC) multiplied by CI, 2) The resulting from 1 multiply by 365, 3) The resulting from 2 multiply by the gross income, the complete costs, then, 4) The variation between the gross income and the complete costs equal the gross (profit) margin (or return).

Although income (gross output) of animals having late AFC was more than that those early and average AFC by year (Table 3), however early and average levels AFC were more than that late AFC income in lifetime production (Table 4).

The present results revealed that the early AFC of the animals led to augmentation in the count of calves born from the buffalo cow, number lactation complete (NLC), prolong the productive life, increasing the amount of milk produced by the animal, therefore increasing the profitability (gross margin) of the animal in the farm.

Moreover, late AFC gave 4.55 and 2.23 parity less per buffalo cow than that of early and average AFC, successively. Economic evaluations stated that the profit for each buffalo cow within the lifetime production were L.E 62960 ($3778), L.E 38538 ($2312) and L.E 3695 ($222) of early, average and late AFC, respectively. Reducing AFC had a positive influence on lifetime profit per buffalo cow. Lifetime profit has increased to about L.E 24400, and L.E 59200, and L.E 34800 when AFC decreased to 30 month from (38 month), to 30 month from (55 month) and to 38 month from (55 month), respectively.

The present Average level of AFC was 37.74 months and very close with obtained by El-Awady *et al*. (2016) in Egyptian buffaloes (36.75 mo) and (Silva and Schorr, 1990) in Brazilian buffaloes (36.25 mo). And was lower than calculated by

Naqvi and Shami (1999) [1266.19 days (41.52 mo)] on Nili-Ravi buffalo in Pakistan. The AFC reported in India was 51.5 mo for Kujang buffaloes (Dash and Mishra, 1990), 62.17 mo for Swamp buffaloes (Gogi *et al*., 1996). Swamp buffaloes in Thailand take from 4 to 8 years for AFC (Konanta, 1992). The lower AFC (22 to 26 mo) reported in Italian buffaloes by Pilla and Moioli (1992). In this respect Naqvi and Shami (1999) revealed that the AFC is an important parameter of reproductive efficiency. The shorter age at first calving, the longer will be the productive life. El-Awady *et al*. (2016) working another set of data on Egyptian buffaloes, found that the profit per cow per lactation was 6032 L.E. and they suggested that, under the Egyptian conditions, the buffalo which produces less than 6 kg milk per day must be called from breeding either large farms or small holder because they cost more than return particular in the resent years under increasing prices of feed animals. Additionally, Ahmad (2002) in a study to estimate the costs of rearing for Buffaloes, Sahiwal and Crossbred heifers in Pakistan, reported that the total cost per buffalo was Rs. 11158 (968.36 EGP according to average of year 2016 prices) while, the total revenue was Rs. 14860 (1289.64 EGP) and the profit per animal was Rs. 3702 (321.28 EGP) and output input ratio was (1.33:1). He recommended that: (1) the heifers of buffalo requires a morass for soaking in the summer months which is necessary it will reduce the labor used to spray the water on animals and (2) rearing of buffalo heifers on concentrated rations in order to the milk production is a profitable business.

Feeding, environment and management play important role in AFC. Chaudhary et al. (1991) reported that green fodder + concentrate and mineral supplement reduce the AFC (1045 days) in Nili-Ravi buffaloes as compare to green fodder + concentrate (1053 days) and green fodder (1472 days). In addition, in India, for Nili-Ravi buffaloes, Eswara Reddy and Taneja (1982) reflected that the average of AFC was 42 months and significantly effected on weight of AFC, first lactation yield, average first lactation yield per day of first lactation length and average first lactation yield per day of first calving interval. All these previous researches were cleared that the value of AFC directly depends on the environmental conditions, feeding and on the organization of the production method and the selection on herds.

Genetic parameters

Heritability (h^2) estimates are shown in Table 5 and were in general moderate to high and positive for productive (0.21 to 0.39) and reproductive traits (0.11 to 0.57). The present estimate of heritabilities for MY trait is in comparable with the reflected of El-Awady (2009) with Egyptian buffaloes (0.39) and El-Arian, et al. (2012) Egyptian buffaloes (0.41). The high and moderate h^2 estimation of MY traits cleared that the genetic gain for these traits can be achieved by selecting the highly productive animals. Also improve management practices. Likewise, the value of h^2 found in the study was higher than that estimated by Seno *et al*. (2007) which was 0.20 and also higher than the obtained by Rosati and van Vleck (2002) being 0.14. As stated by the last authors, there are many facets that impacted the values attained. There is a large variation within and across herds, it constructs the phenotypic and environmental variation become large. There are too inaccuracy in the paternal identification for the animals and it result in loss of a genetic variation.

Moreover, low h^2 for MY and LP were shown by Thevamanoharan (2003), on Nili-Ravi buffaloes. The author reflected that more of the variance in milk trait was caused by environmental conditions and management. Therefore, should be selection programs depended on multiple recording on collateral relative and progeny. These traits could be improved by improvement the environmental conditions.

Tonhati *et al*. (2000) revealed that the h^2 for TMY and AFC were 0.38 and 0.20, successively in Murrah buffaloes. They concluded that the genetic gain for those traits can be achieved by selecting for more productive animals, and they cleared h^2 for LP was 0.01 estimated of h^2 for AFC was low (0.07) clarified by Seno *et al*. (2007) in Murrah. As well, they found that the estimative is caused by the high variation at first lactation, since in repeatability models only those animals with great possibility for MY stay lengthy in herds. Also, Ramos *et al*. (2006) illustrated h^2 of 0.02 for CI. However, the h^2 for CI and NSPC stated that the genetic variances among individuals are applicably small and individual variation with respect to these traits could be declined by management and breeding application. Lower estimate of h^2 for CI and NSPC demonstrated these traits are affected by environmental condition. Moreover, most improve in these traits could be potential by improving nutrition and management systems.

Estimate of h^2 for AFC was 0.57±0.18. The relatively higher h^2 value, clarified that the AFC could be improved by selection. In this respect, Raheja *et al*. (2001) indicated higher estimate of h^2 on Murrah buffaloes. They added that the heritability estimates indicated that the sequential truncation selection by independent culling level, starting with preliminary culling of heifers of very low body weight at one year of age followed by age at first heat and first calving will be useful in bringing about decrease of AFC in the present herd.

Genetic (r_g) and phenotypic ($r_{p)}$ correlations between AFC and other studied traits are in Table 6. Estimation of r_g between AFC and each of MY and MY/D were a negative and has been observed in current study. This clarified that the selection based on MY/D of lactation would bring about decline in AFC with resulting from increase of MY/D of lactation from future generations. Nevertheless, Gajbhiye and Tripathi (1991); Dutt and Taneja (1994) reported positive r_g between AFC and MY/D of lactation. Wished for r_g were found for MY and AFC. The results reported that daughters of bulls with regard to high genetic estimates for MY will eventuate physiologically realization earlier. This result resembled that one indicated by Jahageerdar *et al*. (1997) in Surti buffaloes, was -0.32 of the same traits Nevertheless, a different estimate of r_g was 0.63, indicated by Tonhati *et al*. (2000) in Murrah and crossbred animal to a herd in Brazil.

AFC had positive and very small genetic correlations with lactation length, this may be due to lactation produces the negative energy balance that impaired the reproductive cyclicity. These finding out are likewise in accordance for Ali *et al*. (1992); Gardner *et al*. (1988) studies. The CI significantly correlated to AFC regardless to their extreme AFC levels.

The AFC was correlated with NSPC (+0.31). This finding was agree with this obtained by Verma *et al*. (2018) on Murrah buffaloes in India (+0.35) between AFC and service period. The AFC variably correlated with calving interval (+0.53), within Group 1, first and second lactation. This finding was against with Verma *et al*. (2018) reported a negative correlation between AFC and CI being -0.356 in Murrah buffaloes.

The positive and negligible r_p obtained between AFC and CI was likeness to that with Gajbhiye and Tripathi (1991); Thiruvenkadan *et al*.

Table 1. Shows summary of the presumptions were based on computing the farm's fiscal plan*.

Item	AFC		
	Early	Average	Late
* Age at first calving, (month and/ or days)	30.09, mo 918±41, d	37.74, mo 1151±72, d	54.75, mo 1670±119, d
* Number of buffalo cows and/or percentage	634 (46%)	660 (47%)	94 (7%)
* Cost rearing from birth to weaning, (L.E)**	3700-4200	3700-4200	3700-4200
* Cost rearing from weaning to first calving, (L.E)	24720-28840	31530-36785	47580-55510
* Cost rearing from birth to first calving, (L.E)	28100-29000 (Mean=28670)	35000-41000 (Mean=38100)	51100-52400 (Mean=51550)
* Cost of producing one kg of milk, (L.E)	5.50	5.50	5.50
* Selling price for one kg of milk, (L.E)	10.00	10.00	10.00
* Calf sale price at birth (L.E)	5000	5000	5000
* Labor	350	400	450
* Annual veterinary care cost (L.E)	110	140	160
* Nature/ or artificial insemination (L.E)	75	100	150
* Rectal palpation/time (L.E)	40	60	80
* Annual manure production per head (m^3)	18	20	20
* Price of m^3 manure (L.E)	60	60	60
* Average value of buffalo cow, (L.E)	25000	26000	28000

* Price of input and output is depended on the market and Mehallet Mousa farms gate price from 2000 to 2016.

** The Egyptian pound is the current legal currency of Egypt. The pound is divided into 100 piaster (qirsh) or 1000 milliemes (malleem). The ISO 4217 code for the Egyptian pound is EGP. Locally, the abbreviation LE or L.E, which stands for livre égyptienne (French for Egyptian pound), is frequently used. E£ and £E are also much less-frequently used. The Egyptian Arabic name, ginaih, may be related to the English name guinea and L.E = 0.06 US$ and = 0.05 EURO)

Table 2. Means and standard deviations for studied traits in early, average and late AFC investigated.

Item	AFC		
	Early	Average	Late
* No. of lactations complete (NLC)	8.43±2.3 [a]	6.11±1.36 [b]	3.88±1.51 [c]
* Average milk yield (MY, kg)	1780±774 [a]	1920±607 [c]	2040±812 [b]
* Average daily milk yield (MY/D, kg)	8.10±3.00 [a]	8.37±3.17 [a]	8.99±4.11 [b]
* Average lactation period (LP, days)	256±99 [b]	203±107 [c]	273±87 [a]
* Average dry period (DP, days)	161±32 [c]	236±26 [a]	205±47 [b]
* Calving interval (CI, days)	417±42 [a]	439±97 [b]	478±29 [c]
* Number service per conception (NSPC, count)	1.79±0.54 [b]	1.36±0.77 [c]	2.24±0.88 [a]
* Annual milk yield (AMY, kg)	1558±908 [a]	1596±489 [b]	1558±613 [c]
* Average lifetime milk yield, (LTMY, kg)	20898±3546 [a]	12488±2405 [b]	10271±2943 [c]
* Average lifetime days in milk, d	2626±447 [a]	1684±388 [b]	1245±222 [c]

[a,b,c] Least squares means with different superscripts letters are significantly different at P<0.01.

Table 3. Estimate income (annual gross output) and outcome (variable costs) for each buffalo cow in early, average and late AFC investigated.

Item	AFC		
	Early	Average	Late
Income (gross output)/ buff. cow/year			
Milk	17800	19200	20400
Calves	5000	5000	5000
Manure	1080	1200	1200
Total gross output	23880	25400	26600
Animal value	25000	26000	28000
Outcome (variable cost)/ buff. cow/year			
Feeding	13790	14318	15000
Insemination	75	100	150
Palpation	40	60	80
Veterinary care	110	140	160
Labor	350	400	450
Total variable cost	14365	15018	15840
Cost rearing from birth to first freshen	28670	38100	51550
Benefit (gross margin)/buff. cow/year	9515	10382	10760
Benefit / cost ratio	1.66	1.69	1.68

Table 4. Financial analysis (EGP.) of lifetime production for each buffalo cow in early, average and late AFC investigated and percentages of difference among them.

Item	AFC		
	Early	**Average**	**Late**
Gross output without animal value	229965	186690	135128
Gross output with add animal value	254965	212690	163128
Variable cost with add cost of rearing from birth to first calving	167005	148482	132017
Gross margin	87960	64208	31111
Gross margin without animal value	62960	38208	3111
% of difference between average and late AFC as to early AFC in gross margin without animal value			
Early vs average	+65 (or 1.65 times)		
Early vs late	+2024 (or 20.24 times)		
Average vs late	+1228 (or 12.28 times)		
Variable cost without cost of rearing from birth to first calving	138335	110382	80467

Table 5. Estimates genetic variance components and heritability of the difference productive and reproductive traits studied.

Trait	Variance and covariance components and h2 estimates			
	$\sigma^2 a$	$\sigma^2 e$	$\sigma^2 P$	$h^2 \pm SE$
MY, kg	27198.30	256011.68	283209.98	0.39±0.09
MY/D, kg	0.223	2.66	2.883	0.31±0.07
LP, d	120.23	2217.27	2337.5	0.21±0.08
CI, d	295.80	7483.46	7779.26	0.15±0.06
NSPC	0.014	0.487	0.501	0.11±0.07
AFC, mo	60.815	368.781	429.596	0.57±0.18

Table 6. Estimates of genetic (r_g), phenotypic (r_p) and environmental (r_e) correlations between age at first calving (AFC) and other studied traits.

Traits	Correlations		
	r_g	r_p	r_e
MY	-0.146±0.33	-0.034±0.06	-0.119
MY/D	-0.382±0.30	-0.072±0.05	-0.065
LP	+0.038±0.47	-0.015±0.06	+ 0.052
CI	+0.530±0.49	+0.042±0.06	+0.642
NSPC	+0.31±0.63	+0.075±0.06	-0.070

(2015). The positive and intermediate r_g between AFC and CI reflected that lower AFC results in reduction in CI. Hence, reduction of AFC would reduce the NSPC and also calving interval.

In general, AFC is effected by age at first breeding and the NSPC. In view of the relative constancy of the gestation period. The AFC in this study suggest that the heifers had settled mostly to the first two services itself. The principal advantages for decrease AFC, those decrease rearing costs. Also, decline the period of time in which the animal is only a principal exhaustion in farm resources. Furthermore, reducing AFC as well as can play role to improve the profitability of the enterprises with increasing lifetime milk production and milk production per year of herd life. Because of these advantages necessary steps such as combination of increasing pre-pubertal average daily gain and decreasing age at breeding or reducing age at breeding alone may be taken for better profitability of the farm.

CONCLUSION

The present results indicated that almost 46% of buffaloes having 8th lactation or more than, this is indicator that the lactating Egyptian buffalo have a long lifetime production. A few ratio (7%) of buffaloes (94 out of 1388) having late (extreme) AFC (≥55 months) and showed the poor reproductive than others. Profitability in buffalo cows which had late age at first calving, were more negatively impacted than other two levels of age at first calving. The low AFC buffalo recorded as shorter service period, calving interval, dry period, and longer productive life and highest lifetime milk production, therefore more profitable in the farm. This study suggested that the animals having late AFC were unprofitable during her productive life in the farm, but still needs further investigation of large data with different geographical area and management conditions.

REFFERENCES

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