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Effects of Breed, Calving Season and Parity on Productive and Economic Indices of Dairy Cows

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ABSTRACT

This survey was carried out to assess the effect of cow's breed, calving season and parity on productive and economic parameters of dairy cows under the Egyptian condition. Longitudinal data from 7 commercial dairy herds in Behira, Alexandria and Kafr El-Sheik provinces were collected from 2014 to 2016. Breed classified into Holstein and Brown Swiss, calving season and parity are classified into four categories (winter, spring, summer and autumn), and (1, 2, 3 and ≥4), respectively. Holstein cows yielded 1374.15, 1.42, and 757.68 kg, higher for total milk yield, daily milk yield, and corrected milk yield (305 milk yields), respectively than Brown Swiss cows. Veterinary services costs were higher in Holstein cows than Brown Swiss ones (652.37±2.80 vs. 630.08±4.50 EGP, respectively), while, breeding and cow's depreciation costs were higher in Brown Swiss cows than Holstein ones (386.91±3.49 and 1178.57±3.25 vs. 305.96±3.85 and 1152.44±2.36 EGP, respectively). Although the similarity in total variable costs and total cost costs between the two breeds, Holstein cows had higher return parameters, than Brown Swiss cows. Cows that calved in the winter season had the highest total milk yield, daily milk yield, and corrected milk yield (305 milk yield), than other seasons. Breeding costs were higher for spring calvers. In spite of the higher labor, feed, variable and total costs, there is a superior increase profitability of winter calvers in comparison with other seasons. Cows in first, second and third parity had higher total milk yield, daily milk yield, and corrected milk yield (305 milk yield) than subsequent lactations, consequently, they showed a higher return parameters. At the same trend, veterinary services, breeding costs, feed costs, total variable costs and total costs were higher in first and second parities. Our findings cleared that, Holstein cows, winter calving and first three parity were more profitable for dairy producers.

1. INTRODUCTION:

Milk sector provides employment opportunities for more than 25% of the working force in some Middle East and North Africa countries (Maitah and Smutka, 2012). In Egypt, milk and milk products production were 5896, 5940 and 5960 tones from the years (2012-2014), 2015 and 2016, respectively. Also, milk and milk products imported in Egypt were 1354, 1564 and 1594 tones from the (2012-2014), 2015 and 2016, respectively, while milk and milk products exported were 497, 530 and 497, respectively (FAO, 2016).

The lactation performance of dairy cattle is usually measured by determining the total milk yield per lactation or per year, average daily milk yield, lactation length and lactation persistency (Nigussie, 2006). Milk yield is a very important factor for dairy farm profitability (Krpálková et al., 2014), and the total returns from dairy production mainly come from the sale of milk to milk collection centers owned by dairy cooperatives or businesses. However, a portion of farm revenue also comes from the sale of calves; in particular bull calves, aged or culls cows, and in some farms the sale of manure as good fertilizers in agriculture fields (Hall et al., 2004).

The most important factors affecting dairy production, reproduction and economics in Egypt include breeds, locality, sector, herd size, calving season, and disease incidence (Omar, 2009). The choice of superior breeds have to be considered not only by genetic aspects but also other related factors especially farmers' experiences in livestock, socio-economic and market conditions and profitable and practical levels of feeding, management and health cares (Chantalakhana, 1998). Milk productivity of Holstein dairy cows has been greatly improved during the last six decades. This is mainly due to the combination of genetic improvement for high milk production and the advance of nutritional management (Butler, 2000; Lucy, 2001 and Dobson *et al*, 2007). On the other hand, Brown Swiss dairy cows, despite their lower milk production level compared with Holstein cows, have drawn the attention of farmers for their milk quality traits (higher fat and protein content, and better coagulation properties) suited to cheese manufacture (De Marchi et al., 2008). Additionally, Kahi et al. (2000) concluded that daily return of productive herd life was not significantly different among Brown Swiss, Friesian and Ayrshire breeds. However comparison of two dairy breeds in our study based on their milk production and economic efficiency under the Egyptian conditions are not available in the literatures.

Calving season had a significant effect on milk production (Rehman et al., 2006). Feed availability, quality of fodder, and incidence of disease might contribute to the influence of calving season on milk yield (Ahmed, 2011). Calving season had a great effect on total return and net return where, the highest values were for Holstein-Friesian cows calved in winter season than other breeds calved in other seasons, while, the highest feed costs and total costs were for Holstein-Friesian cows calved in summer season (Atallah et al., 2015) . In contrast, Korver (1977) also found that autumn calving cows raised the highest revenues while the lowest net revenues were obtained from spring calving cows.

There is highly significant effect of parity on lactation milk yield was observed in Gir cattle (Indian breed), where highest lactation milk yield during fifth parity (2694.20±184.94 kg.) and significant drop after eighth parity (Dangar and Vataliya, 2015). Mellado et al. (2016) reported that, the average daily milk yield from 305 to>450 days in milk was 29.9 and 31.9 kg for primiparous and multiparous cows, respectively. Arbel et al. (2001) found that net profit increased with extension of calving interval from \$0.19 and \$0.12 /d of CI for primiparous and multiparous cows, respectively.

The purpose of this paper was to determine the associations of cow's breed, calving season, and parity with productive and economic performance of dairy cows under Egyptian conditions.

2. MATERIALS AND METHODS:

2.1. Study population and sampling

A total of 5213 dairy records were randomly selected from five dairy herds which had been accepted the request to participate in this study. The breeds which subjected to this study included Holstein breed which is the majority of the collected data. Additionally, only one Brown Swiss farm has been found to contribute this work. Records were collected during the period started from 20 December 2014 to 30 December 2016. The localities which the dairy farms were located are El-Beheira, Alexandria and Kafr El-Sheik provinces.

2.2. Animal management:

Cows on the participating farms were housed in the free-stall, shaded open yards with sand floor or concrete floors bedded with straw or sawdust, supplied with a cool spraying system during hot climate. Animals were grouped according to average daily milk yield into fresh (from calving day till 60 days post-partum), high producing cows and low producing cows, all groups of cows were fed a balanced total mixed ration (TMR) but the composition of the diets differed depending on the region and management. Water was freely available all times. The cows were milked in the parlor systems three times daily.

Each milking unit had milk meters capable of automatically recording milk production and milk conductivity. Farm personnel used DairyComp305 herd management software to record lactation, reproductive, and medical data for each cow. The dry period was 60 days prior to calving and, it divided into early dry (far –off) dry period from 60-21 days before calving and late dry (21) days before calving.

Heifers were artificially inseminated for the first time when reaching 380 kg of weight and pregnancy was detected by rectal palpation 60 days after service. Estrus was detected by visually monitoring cows for thirty minutes a.m. and p.m. near predicted estrus. Cows exhibiting estrus after day 60 postpartum were mated via artificial insemination. Insemination occurred approximately 12 hours after a cow was first observed standing for mounting.

2.3. Variables

The independent variables were breed of dairy cows (Holstein and Brown Swiss), Calving season classes were created: autumn (21st September to 20th December), winter (21st December to 20th

March), spring (21st March to 20th June), and summer (21st June to 20th September) and Parity groups included (1, 2, 3, ≥4).

The dependant variables for productive traits were (total milk yield, daily milk yield, and corrected milk yield (305 milk yields) and economic traits were (labour costs, veterinary services, breeding costs, feed costs, cow depreciation costs, total variable costs (TVC) and total costs (TC), milk sale, total return, net return, and income over feed costs (IOFC)).

Total variable costs include the prices of drugs, vaccines, disinfectants, veterinary supervision, breeding costs, feed cost, labour cost and other miscellaneous costs have been spent on other facilities such as water and electricity etc, according to (Jayaweera et al., 2007). All the calculated costs based on the prevailing prices during the period of the study and were calculated on the basis of Egyptian pound (EGP). Total costs included total feed costs, labour costs, the miscellaneous costs, the costs for veterinary services and breeding operations, depreciation of fixed assets, cow depreciation costs according to, (Krpalkova et al., 2016).

Income over feed costs (IOFC) which used to measure income without fixed and labour costs. It shows the present profitability of the animal having a dry date or the cow entered the herd and calculated according to (Jagannatha et al., 1995) by multiplying milk yield per cow by current milk price minus total feed cost per cow).

2.4. Statistical analyses:

The data were analyzed using a PROC GLM model in the SAS 9.2 (SAS Institute 2008) on the independent variables breed, calving season, and parity. Duncan's multiple range test was used to determine the significant differences among means of analysed parameters which related to productive and economic parameters of dairy production and significance was declared when (P<0.05).

The general statistical model was:

$X_{i\,kl} = \mu + B_i + P_k + C_l + e_{ikl}$

Where

$X_{i\,kl}$ = value of the dependent variable (Tables 1,2 and 3); μ= Over all mean; B_i = Effect of i^{th} Breed (i=1 Holstein and 2 Brown Swiss); P_k = Effect of k^{th} Parity (k=1, 2, 3, and ≥4); C = Effect of l^{th} calving season (l=winter from 21^{st} December to 20^{th} March; 2=spring from 21^{st} March to 20^{th} June; 3=summer from 21^{st} June to 20^{th} August and 4=autumn from 21^{st} August to 20^{th} December; e_{ikl}= random error.

3. RESULTS:

3.1. Breed effects:

Synopsis of the significant results for the effect of cow's breed on the milk production indices, including total milk yield (Total-MY), 305-d milk yield (305-MY), and daily milk yield (DMY) were existed in Table1.Holstein cows noted for their superior ability for milk production, which represented in their notable milk production parameters. Holstein cows had significantly higher total-MY, 305-MY and DMY (9665.48, 8493.38, and 26.78 kg, respectively) than Brown Swiss cows (8291.33, 7735.7 and 25.36 kg, respectively).

A summary of significant results for the effect of cow's breed on the costs were represented in Table2. Our results showed that there was no statistically difference between two breeds in labor costs, total feed cost, TVC and, TC between two breeds. In contrast breeding costs and cow's depreciation were higher in Brown Swiss (386.91 and 1178.57 EGP, respectively) compared to Holstein breed (305.96 and 1152.44 EGP, respectively).On the other hand veterinary services were higher in Holstein cows than Brown Swiss (652.37vs. 630.08 EGP, respectively.

Holstein cows had significantly higher milk return, total return, net return and IOFC (40287.63, 44861.05, 16776.29 and 15523.33 EGP, respectively) than Brown Swiss cows (35238.14, 40450.14, 12266.46 and 10453.32 EGP, respectively; Table 3).

3.2. Calving season effects:

Total-MY, 305-MY and DMY were significantly greater in cows that calved during the winter season (9818.91, 8550.47and 27.20 kg, respectively) compared to those calved during spring (9531.85, 8325.99 and 26.27 kg, respectively), summer (9550.13, 8407.80 and 26.60 kg, respectively) and autumn (9253.93, 8369.92 and 26.38 kg, respectively). Non-significant differences were observed in total-MY, 305-MY and DMY between cows that calved during the spring, summer and autumn seasons in the current research, except autumn season showed the lowest total-MY in comparison with other seasons.

Winter calvers had the highest labor costs, feed costs, total variable costs and, total costs (674.93±6.83, 25433.86±182.97, 27278.78±194.06, and 28789.53±193.52, respectively) compared to those calved in other seasons. Meanwhile, high breeding costs were for those calved in spring season (338.48±9.45) compared to winter, summer and autumn seasons (318.24±7.41, 305.10±6.90 and300.48±6.54, respectively). Furthermore, calving season hadn't any significant effect in veterinary services and cow's depreciation costs (Table 2).With regards to impact of calving season on return parameters was showed in Table3. It clear that cows that freshened in winter season had significantly higher profitability measures including milk return, total return, net return and IOFC (40918.67±320.39, 45527.03±321.44, 16737.50±190.75 and15484.81±193.23, respectively) than those calved in other seasons. In contrast, cows calved in autumn showed the least of all these parameters (38640.23±301.15, 43283.86±301.07, 16002.22±180.38 and14653.82±183.24, respectively).

3.3. Parity effects:

Data summarizing the effects of parity on total-MY, 305-MY and DMY are illustrated in Tables 1. Second parity had higher total-MY and DMY (9796.94±67.23 and 27.09±0.15 kg, respectively) than first, third and older parities. Also, second and third parities had a higher 305-MY (8594.68 and 8652.05 kg, respectively) than first and older ones (8194.38 and 8225.69 kg, respectively).First and third parities came in the second class in these parameters. Results of the parity impacts on cost parameters are illustrated in Table 2.First and second parities had higher veterinary services, breeding costs, total feed cost, total variable costs and total costs than subsequent ones. However, cows in third and older parities had higher cow depreciation costs (1172.37±4.99 and1173.72±6.22 EGP, respectively) than first and second ones (1139.66±3.60 and 1154.73±3.60 EGP, respectively). Also, labor costs were higher in first and older parities (673.46±5.59 and686.83±10.95 EGP, respectively) than second and third ones (642.08±4.97 and639.03±7.98 EGP, respectively). As regards to profits are showed in Table 3. The results revealed that cows in their second parity had the highest profitability measures indicated in milk return, total return, net return and IOFC (41005.66±288.91, 45621.49±290.05, 17159.52±172.19 and15880.67±174.41 EGP) than previous and subsequent lactations. Moreover, cows in older (4 or more) showed the lowest values of these measures (37691.71±469.40, 42313.69±470.73, 14737.80±295.34 and13443.99±297.54, respectively).

Table1. Means and standard errors for (TMY, DMY and 305-MY) as affected by breed, calving season and parity (kg):

Item	N	TMY	DMY	305-MY
Breed:				
Brown Swiss	495	8291.33±79.05^{b}	25.36±0.12^{b}	7735.7±35.31^{b}
Holstein	4718	9665.48±41.19^{a}	26.78±0.09^{a}	8493.38±29.07^{a}
Calving season:				
Winter	1462	9818.91±74.69^{a}	27.20±0.16^{a}	8550.47±50.11^{a}
Spring	971	9531.85±85.98^{b}	26.27±0.19^{b}	8325.99±59.89^{b}
Summer	1247	9550.13±77.33^{b}	26.60±0.18^{b}	8407.80±55.72^{b}
Autumn	1533	9253.93±70.64^{c}	26.38±0.16^{b}	8369.92±49.55^{b}
Parity:				
1	1821	9566.59±63.29^{b}	26.54±0.14^{b}	8194.38±43.77^{b}
2	1828	9796.94±67.23^{a}	27.09±0.15^{a}	8594.68±45.33^{a}
3	945	9264.52±87.72^{c}	26.70±0.21^{ab}	8652.05±63.14^{a}
≥4	619	9081.43±109.31^{c}	25.55±0.25^{c}	8225.69±78.84^{b}

Means within the same column in each category carry different superscripts are significantly different (P<0.05).
TMY= Total milk yield. DMY= Daily milk yield. 305-MY= 305-d milk yield.

Table 2. Means and standard errors for (labor costs, veterinary services costs, breeding costs, feed costs, TVC, cow's depreciation costs and TC) as affected by breed, calving season and parity (EGP):

Item	N	Labor costs	Veterinary services	Breeding costs	Feed costs	TVC	Cow's depreciations	TC
Breed:								
Brown Swiss	495	657.12±4.69[a]	630.08±4.50[b]	386.91±3.49[a]	24784.82±258.45[a]	26645.11±270.59[a]	1178.57±3.56[a]	28183.68±270.59[a]
Holstein	4718	657.87±3.58[a]	652.37±2.80[a]	305.96±3.85[b]	24764.30±98.59[a]	26577.34±104.26[a]	1152.44±2.36[b]	28084.76±103.87[a]
Calving season:								
Winter	1462	674.93±6.83[a]	654.70±5.13[a]	318.24±7.41[b]	25433.86±182.97[a]	27278.78±194.06[a]	1153.95±4.15[a]	28789.53±193.52[a]
Spring	971	662.52±7.21[ab]	648.29±5.77[a]	338.48±9.45[a]	24885.58±210.52[b]	26732.35±222.24[b]	1162.83±4.85[a]	28254.67±221.36[b]
Summer	1247	645.62±6.10[c]	653.18±5.08[a]	305.10±6.90[b]	24849.30±183.00[b]	26649.27±192.58[b]	1152.79±4.40[a]	28152.75±191.82[b]
Autumn	1533	648.39±5.96[bc]	644.86±4.67[a]	300.48±6.54[b]	23986.41±167.31[c]	25773.58±176.87[c]	1152.57±3.87[a]	27281.65±176.23[c]
Parity:								
1	1821	673.46±5.59[a]	658.46±4.65[a]	327.10±6.41[a]	24972.50±157.69[a]	26826.13±166.38[a]	1139.66±3.60[c]	28338.39±165.79[a]
2	1828	642.08±4.97[b]	658.63±4.29[a]	336.94±6.86[a]	25124.99±160.39[a]	26960.47±170.13[a]	1154.73±3.60[b]	28461.96±169.37[a]
3	945	639.03±7.98[b]	626.19±5.39[c]	265.07±7.23[b]	24014.50±207.10[b]	25738.07±218.34[b]	1172.37±4.99[a]	27251.49±218.07[b]
≥4	619	686.83±10.95[a]	638.07±7.10[b]	279.43±9.20[b]	24247.72±255.85[b]	26049.47±268.80[b]	1173.72±6.22[a]	27575.89±268.02[b]

Means within the same column in each category carry different superscripts are significantly different ($P<0.05$).
TVC= Total variable costs. TC= Total costs.

Table 3. Means and standard errors for (milk return, total return, net return and IOFC) as affected by breed, calving season and parity (EGP):

Item	N	Milk return	Total return	Net return	IOFC
Breed:					
Brown Swiss	495	35238.14±335.98[b]	40450.14±335.98[b]	12266.46±139.77[b]	10453.32±153.00[b]
Holstein	4718	40287.63±176.41[a]	44861.05±177.09[a]	16776.29±106.59[a]	15523.33±107.45[a]
Calving season:					
winter	1462	40918.67±320.39[a]	45527.03±321.44[a]	16737.50±190.75[a]	15484.81±193.23[a]
spring	971	39823.18±367.13[b]	44507.14±367.45[b]	16252.48±218.43[ab]	14937.6±222.97[b]
summer	1247	39930.26±329.34[b]	44543.80±330.45[b]	16391.05±208.00[ab]	15080.97±209.53[ab]
autumn	1533	38640.23±301.15[c]	43283.86±301.07[c]	16002.22±180.38[b]	14653.82±183.24[b]
Parity:					
1	1821	39946.44±267.76[b]	44620.63±267.38[b]	16282.24±155.61[b]	14973.94±159.67[b]
2	1828	41005.66±288.91[a]	45621.49±290.05[a]	17159.52±172.19[a]	15880.67±174.41[a]
3	945	38611.57±373.10[c]	43211.44±373.92[c]	15959.95±239.37[b]	14597.06±239.49[b]
≥4	619	37691.71±469.40[d]	42313.69±470.73[c]	14737.80±295.34[c]	13443.99±297.54[c]

Means within the same column in each category carry different superscripts are significantly different ($P<0.05$).
IOFC= Income over feed cost.

4. **DISCUSSION**:

The primary objectives of this study were to investigate impact of cow's breed, calving season and parity on productive and economic parameters of dairy cow under stressful Egyptian conditions. The significant effects of cow's breed on productive traits are in agreement with findings of (Omar 2009). Holstein cows showed better results in the investigated milk production indices when compared to Brown Swiss cows as documented by Koc (2007) who found that Holstein Friesians produced 1.83 kg more milk/day than Brown Swiss cows in Mediterranean climatic conditions of Turkey. Our results also are consistent with the findings of De Marchi et al. (2008), where Holstein Friesian cows produced 9% more milk per day than Brown Swiss cows. Recently, in agreement with our study Ríos-Utrera et al., (2013) found that Holstein Friesian cows yielded 261, 0.8 and 0.7 kg more milk per lactation, per day and per calving interval, respectively, than Brown Swiss cows. The variation in milk production indices between the two breeds may be due to the effect of lower body condition score values at calving and to greater and longer loss of body condition score at the beginning of lactation in Holstein Friesian cows compared to that of Brown Swiss cows (Gergovska et al., 2011). In the current study, we noticed non-significant difference in labor cost, feed costs, total variable costs and total costs between Holstein and Brown Swiss cows as the dairy farmers manage the two breeds similarly. Whilst veterinary services and breeding costs differed between the two breeds, this result was in accordance with result of El-Tahawy and Omar (2010), where veterinary management and sperm costs differed significantly ($p<0.01$) and were 53.3 and 35.1 (EUR/dairy animal) for Holstein and Brown Swiss, respectively. They found non-significant difference between two breeds in total return and net return. In contrast, our findings revealed significant difference between two breeds in return parameters including milk return, total return, net return and IOFC where Holsteins showed the highest values These findings were supported by Holmann et al. (1990) compared the profitability of dual purpose with Holstein crossbred cattle found that, milk income over feed cost for dairy cattle was higher than for dual purposes. This probably due to higher volume of milk production in Holstein cows.

Concerning calving season, our results revealed that calving season had significant effects on all productive traits studied, where winter season showed the highest milk production including total-MY, 305-MY and DMY while, autumn season showed the lowest of these traits. Results of Barozai et al. (2011) indicated that, Holstein- Friesian cattle that calved in winter season produced higher milk yield (4131.65 liters) , while summer and spring calving ranked second and third with average lactation milk yield (3830.66 L) and (3814.35 L) , respectively. However, autumn calving produced lowest milk yield (3795.91liters), in conformity with present comparison. Also our results were in agreement with Bajwa et al. (2004), where summer calvers produced (184 kg) less milk (1361 vs 1545 kg) as compared to winter calvers even after the adjustment for lactation length, winter calvers produced 1797 kg as compared to 1694 kg for summer calvers. In contrast, Ngoc Hieu Vu et al. (2016) concluded that cows that calved in dry season produced more milk than those calved in rainy season. The calving season effect on milk yield parameters observed in the present investigation is not in agreement with that of Afridi (1999), who informed that Holstein Friesian cows that calved during the spring season had significantly greater milk yield than those that calved during the winter season (3215 vs. 2891 kg).Another study carried out by Bilal et al. (2008) revealed that calving season hadn’t significant impact on milk yield and the values were 3617.50±148.88, 3705.27±168.42, 3607.23±160.54 and 3615.07±151.78 kg for winter, spring, summer and autumn, respectively, on contrary to our study. With reference to the effect of calving season on costs, labor costs, feed costs, total variable costs and total costs were higher in winter season compared to other seasons, and autumn season had the lowest of these values. Miller et al. (1971) found that calving season on feed cost was higher in cows calved from January to March, while those calved from July to September showed the lowest feed cost and this boosted our results about feed cost. These differences to variation in quality and quantity of feeds especially forage from year to another. Non-significant differences were observed in veterinary services and cow's depreciation among different calving seasons. While, breeding costs were the highest in cows freshened in spring season than other seasons, the reason may be due to cows calved in spring season will be inseminated in the next summer season, and Holstein cows are sensitive to heat stress so increase ambient and body temperatures will decrease conception rate and subsequently increase service per conception (Chebel et al., 2004) and this in return will increase breeding costs, this result indicate that the hot season adversely affects the fertility of Holsteins. Milk return, total return, net return and IOFC were higher in cows calved winter season and those calved in autumn season showed the lowest values. Our results are in accordance with Van Arendonk (1985) who found that cows calved in November showed higher average return than those calved in April due to higher return from milk sale and calf sale, also feed costs was higher in cows calved in November which attributed to effect of season on milk yield and composition. On contrary to our results, Jalvingh et al. (1993) concluded that, the most profitable season of calving was autumn and milk price differences was the main determinant of seasonal variation in herds.

Our results regarding the effect of parity on milk yield parameters (total-MY, 305-MY and DMY) were comparable to those obtained by Khattab et al. (2005), who demonstrated that second and third parities had highest 305-MY (5349 ± 53 and 4984 ± 58), respectively than first, fourth and fifth ones (4320 ± 53, 4868 ± 59 and 4389 ± 85), respectively. Also, the results of Ngodigha and Etokeren (2009) , working with crossbred cows of different Holstein Friesian inheritance (50, 75, 87.5 and 100%), found that first (4554±469 kg), second (5427±455 kg) and third-parity dams (5139±441 kg) yielded more milk than fourth parity dams (2896±430 kg). On the other hand, Gader et al. (2007) and Ríos-Utrera et al. (2013) found that third and fourth parity dams had greater milk yield per lactation and milk yield per day than first and second parity dams and that second parity dams had greater milk yield per lactation and milk yield per day than first parity dams. With reference to the effect of parity on the cost parameters, veterinary services costs, breeding costs, feed costs, total variable and total costs were higher in cows in first and second parities than older parities. We can attribute our results to the fact of high production in first lactations than older ones, so cows needed more managemental operations and consequently more costs. While, labor costs were higher in first and older ones and cow's depreciation costs higher in older cows. But there are no other published data on the variation of costs in the different parities. Return parameters that represented in milk return, total return, net return and IOFC were higher in cows in their second parity followed by others in their first and third parities and lastly those in fourth or older parities. Our results agreed with Inchaisri et al. (2010), where, the net economic losses increased with increased parity for all cows had good, average and poor reproductive performance.

In conclusion, this study revealed that Holstein cows had greater milk yield and ultimately a higher profitability than Brown Swiss cows, however feed costs, total variable costs and total costs didn’t differ between the two breeds. Milk yield and return parameters were maximum in cows calved during the winter season even though they had higher feed costs, total variable costs and total costs. Despite the fact that cows in their second parity had a higher feed costs, total variable costs and total costs, they showed the maximum milk yields and returns parameters .On the other hand, after the third parity, productivity and profitability of dairy cows began to decline. This explains why, most dairy farmers take strategy of culling cows after their third parity. Our recommendations to the dairy farmers are firstly, Holstein cows are more productive and profitable than Brown Swiss. Secondly, they should make cows to calve in winter season by using good estrus synchronization program. Finally, culling cows after third parity is more economic.

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