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Reproductive and Productive Performance of Holstein Friesian and Crossbreed Dairy Cattle at Large, Medium and Small Scale Dairy Farms in Ethiopia

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Abstract

The economy of livestock production largely depends upon the reproductive efficiency of the animals. A semi-structured questionnaire and recorded data were conducted to determine the reproductive and productive performance Holstein Friesian and crossbreed dairy cows at large, medium and small scale dairy farms of Harar, Dire-Dawa, Bishoftu, Holeta and Mekele. A total of 236 households for questionnaire and 560 recorded data (284, Holstein Friesian and 276, crossbreed dairycows) were considered. Data were analyzed using the Statistical analysis software (SAS, 2008). The mean overall percent (84.72% and 84.84%, for Holstein Friesian and crossbreed producers, respectively) of the respondent were male respondent. The overall reported mean family size was 2.59 ± 0.86 and 2.81± 1.18 persons for Holstein Friesian and crossbreed dairy producers, respectively. In the study farms, majority of the respondents had secondary educational background with overall percentage value of 54.44 and 61.83, for Holstein Friesian and crossbreed dairy farms, respectively. For Holstein Friesian dairy cows, age at first service and age at first calving was non-significant (P>0.05) among dairy producers. For the crossbreed dairy cows, there was a significant difference (P<0.05) among large scale and the other two production system and non-significant difference (P>0.05) between medium and small scale crossbreed producers for age at first service and age at first calving. The overall mean age first service was (811.14±6.29 and 849.58±9.31 days) and age at first calving was (1085.01±6.49 and 1125.44±9.28, day's) both for Holstein Friesian and crossbreed dairy producers, respectively. The overall mean daily milk yield was 12.57±0.08 and 10.45±0.07 liters for Holstein Friesian and crossbreed dairy cows, respectively and the overall mean lactation milk yield was 3032.41±66.78 and 2913.78±61.88 liters for Holstein Friesian and crossbreed dairy cows, respectively. Results of the present study revealed that reproductive and productive performance was low so, to progress their performances it need a planned technical and institutional interventions.

Keywords: Dairy cattle, Productive, Reproductive

1. Introduction

Ethiopia is an agro-based and densely populated developing country where most of the people are dependent for their livelihood mainly on livestock and crop farming. The Livestock sub-sector is playing a crucial role in the traditional subsistence farming, contributing about 16.5% of national gross domestic product (GDP) (Metaferia *et al*., 2011) and provides employment opportunity to 30% of the population (Behnke, 2010).The total livestock population of Ethiopia is 59.5 million cattle, of which 7.16 are dairy cows (CSA, 2016/17). The large cattle population, favorable climate for improved, high yielding cattle breeds; and the relatively animal disease free environment make Ethiopia to hold a substantial potential for dairy development (Zelalem, 2012).Despite the country's high livestock holding, great potential and sustained development efforts to get the subsector moving forward, productivity has remained low and still subsistence oriented in Ethiopia. A number of interrelated, complex and dynamic economic, technical, policy and institutional challenges have hampered the subsector (Yoseph et al., 2003).

In order to improve the low productivity of local cattle, the government of Ethiopia is introducing exotic breeds, selection within indigenous breeds as well as cross breeding of these indigenous breed with high producing exotic cattle has been considered as a practical solution (Tadesse, 2002). Crossbreeding in Ethiopia was initiated in the early 1950s but unfortunately the crossbreeding activities were not based on clearly defined breeding policy with regard to the level of exotic inheritance and the breed types to be used. The economy of livestock production largely depends upon the reproductive efficiency of the animals. Reproductive performance is a biologically crucial phenomenon, which determines the efficiency of animal production. The reproductive performance of dairy cows is the most important factor that is a prerequisite for sustainable dairy production system and influencing the productivity (Kiwuwa *et al.*, 1983).The production of milk and reproductive stock is not possible unless the cow reproduces. Poor reproductive performance is caused by failure of the cow to become pregnant primarily due to anoestrus (pre- pubertal or post-partum); failure of the cow to maintain the pregnancy and calf losses(Mukasa-Mugrwa, 1989; Perera, 1999).

Ethiopia has given the priority on the development of dairying at farmer's level to increase the supply of milk. A large number of exotic and crossbreds dairy cows are raised in large, medium and small scale dairy farms and most of the researches were done on smallholder and there was no study has been done so far on large, medium and small scale Holstein Friesian and crossbreed dairy farms of the country. Therefore, the present study was designed to assess the reproductive and productive performance of Holstein Friesian and crossbreed dairy cows at large, medium and small scale dairy farms of Ethiopia.

2. Materials and Methods

2.1. Description of the study area

The study was conducted at the selected large, medium and small scale dairy farms of Dire Dawa, Harar, Bishoftu dairy farms and Mekele. Moreover, at an institutional dairy farms of Haramaya University and Holeta agricultural research center were also used for the study.

Dire Dawa

Dire Dawa is geographically located in eastern parts of Ethiopia between 9°27'E and 49'N latitude and between 41°38' N and 19'E longitude and is located 515 km away from Addis Ababa (Melese and Dutamo, 2015). Topographically, it is a dissected mountainous region and its altitude varying from 950 meters above sea level inthe Northeast lowlands to 2,260 meters above sea level in the southeast highlands. Dire Dawa has a bimodal rainfall with the mean annual rainfall varying from 550 mm in the northern lowlands to about 850 mm in the southern mountains. The mean annual maximum and minimum temperatures of the town are 31.4^{0}C and 18.41^{0}C, respectively (Mumed and Eshetu, 2015). The total human population of the town is estimated at 288,000 with a growth rate of 2.5% (CSA, 2013).

Harar

The Harari region is one of the nine administrative regions of Ethiopia. Harari National Regional State is located at a distance of 525 km eastern of Addis Ababa (Salih, 2009). The Harari region lies between latitude 9˚24'N and 9˚42'03"E and 42˚16'E longitude. The Harari region has a wet tropical and receives an annual rainfall between 596 mm and 900 mm in a bimodal pattern. It is located at an altitude of 1850 meters above sea level and has a mean annual maximum and minimum temperature of 25 and 10°C, respectively (Abebe et al., 2014). The total human population of the town is estimated at 125,000 with a growth rate of 2.6% (CSA, 2013).

Bishoftu:

Bishoftu is a town and separate district located in the East Shewa zone at a distance of 45 km South East of Addis Ababa, Ethiopia. The town is located in east Showa zone of Oromiaregion and it lies 9° North latitude and 40° East longitude at an altitude of 1850 meters above sea level in the central high land of Ethiopia. It has an annual rainfall of 866 mm of which 84% is in the long rainy season (June to September) and the remaining in the short rainy season extending from March to May. The mean annual maximum and minimum temperatures of the area are 26°C and 14°C, respectively, with mean relative humidity of 61.3% (IPMS, 2005).

Holota:

Holota is a town and separate district in the Oromia special zone surrounding Finfinnee. The town is located 40 km west of Addis Ababa at 9°30' N and 38°30' E with altitude range from 2300-3800 meters above sea level. The annual mean temperature ranges from 14°c to 24°c and annual rainfall ranges from 900-1100 mm. According to the population and housing censes of 2007 the population of the town is 23,296 (CSA, 2007)

Mekele

Mekelle, the regional capital city of the Tigray region, is located in the northern Ethiopia high lands at 777 km drive north of national capital city, Addis Ababa. Geographically it is located between 13^{0}24’ to 13^{0}36’ latitude and 39^{0}25’ to 39^{0}38’ longitude. It has an average altitude of 2200 meters above sea level with a mean minimum, mean maximum and mean average monthly temperatures of 8.7, 26.8 and 17.6° C, respectively (Kibrom, 2005). Mekelle has an estimated total population of 215,546 (CSA, 2008).

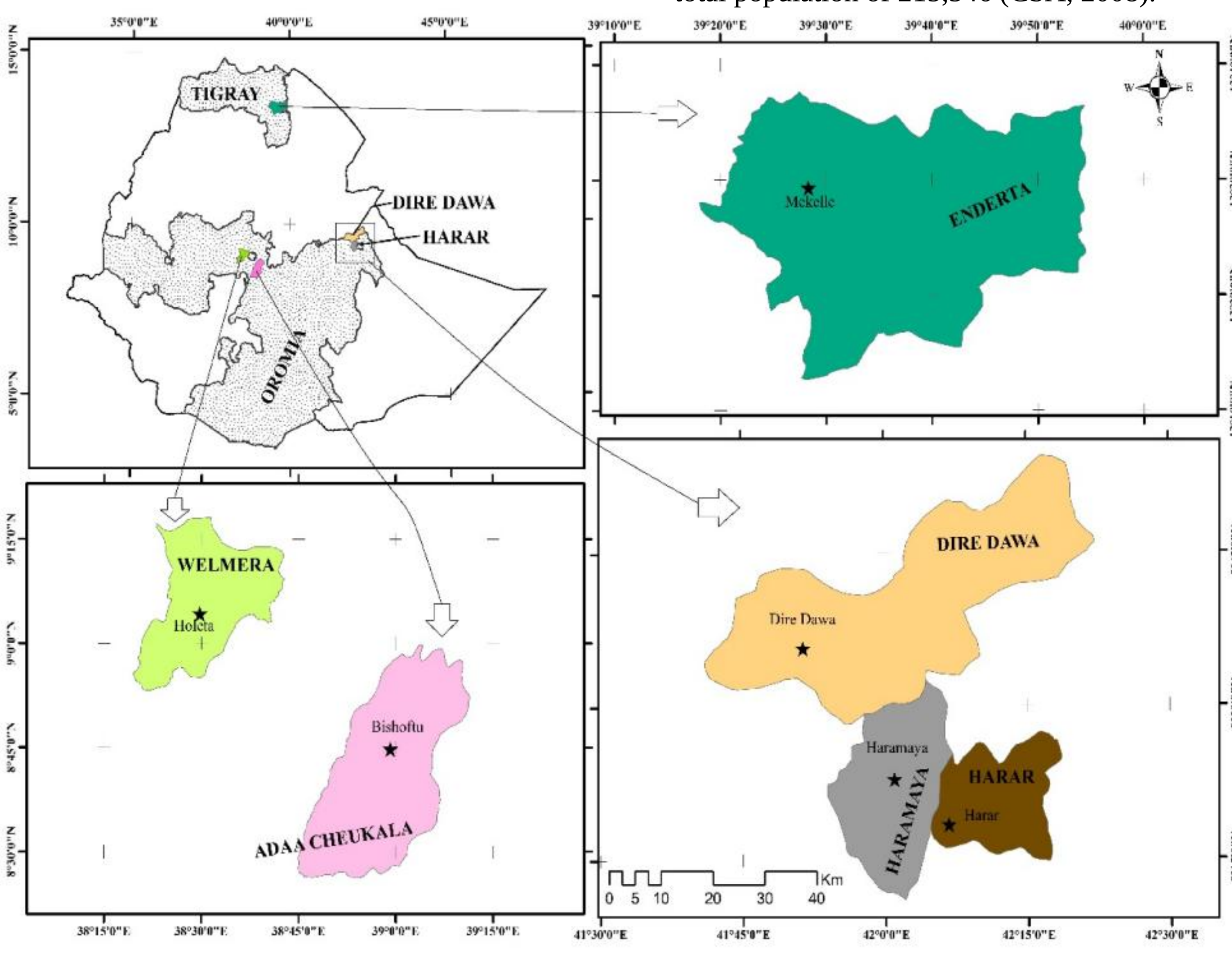

Fig1. Study area

2.2. Sampling Strategy and Data Collection

In order to illustrate the reproductive and productive performance, data were collected from recorded book and using semi-structured questionnaire at the selected large, medium and small scale dairy farms of, Dire-dawa, Harar, Bishoftu, Holeta and Mekele dairy farms purposely. Before the actual work was started, focused group discussions were held with the different experts working, at the regional and zonal agricultural development office. Discussions were also made with dairy cattle owners and developmental agents across all the production systems to introduce the objective of this research and to recognize the current household characteristics of the respondents. Multi-stage purposive and simple random sampling procedure was implemented at three stages. In the first stage, dairy farms were identified based on the milk production potentials and accessibility. In the second stage dairy cattle producers were identified and categorized based on the number of dairy cow. In the third stage, individual dairy cow producers were randomly selected from the list for an interview. The total number of households interviewed on the dairy production system was 236 (40, 85 and 111, households for large scale, medium scale and small scale dairy farms, respectively). The questionnaire was tested before the actual survey to ensure that all questions were sufficiently clear for the interviewees and data were collected by trained enumerators.

2.3. Data analysis

The data were entered and organized in the excel spread sheet and then they were analyzed using Statistical analysis software (SAS, 2008). A one-way analysis of variance was applied for quantitative dependents variables using the production systems as independent variable.ANOVA comparison was performed using significance level at ($P<0.05$). Breeding goal preferences were ranked by calculating index values with the principle of weighted average according to the following formula.

$$\textbf{Index} = (R_n \times C_1 + R_{n-1} \times C_2 \ldots + R_1 \times C_n) / \sum(R_n \times C_1 + R_{n-1} \times C_2 + \ldots + R_1 \times C_n)$$

Where, R_n = the last rank. C_n= the % of respondents in the last rank, C_1 = the % of respondents ranked first.

3. Results and Discussion

3.1. Household Characteristics

Household characteristics of respondents of the study areas are presented in Table 1. The average family size per household for Holstein Friesian dairy producers were 2.40, 3.20 and 2.17 in large, medium and in small scale dairy cattle producers, respectively, with the overall mean of 2.59 persons per family. Family size was significant ($P<0.05$) between large and medium scale and between medium and small scale Holstein Friesian dairy producerswhereas, it was non-significant ($P>0.05$) between large and small scale Holstein Friesian dairy producers.The overall average family size observed in the present study was smaller than that reported by Gatwech (2012) who found that the overall mean household size in Gambella was 7.72 persons per household and Belay and Geert (2014) who reported of 6.02 persons in Jimma town. Similarly for crossbreed dairy producers the average family size were 2.4, 3.2 and 2.83, respectively with an overall average of 2.81, persons per family. Family size was significant ($P<0.05$) between large and medium scale crossbreed dairy producers but, non-significant ($P>0.05$) among the other crossbreed dairy producers. The overall family size obtained for the crossbreed dairy producers were lower than that reported by Ayalew (2017) who found that the overall mean household size in South wollo was 5.08 persons per household and Adebabay (2009) findings of 7.1 persons in Burea district.

The majority of the respondents (95%, 82.50% and 76.67% for large, medium and small scale, Holstein Friesian, respectively) were male with an overall of percentage of 84.72, and for the crossbreed dairy producers, majority (95%, 75.56%, and 83.95%, respectively) of the producers were male with an overall mean percentage of 84.84. The overall male respondents obtained in the present study farms were higherthan Belay and Geert (2016) who found that 75.9% of the respondents were male in the smallholder dairy farmers of Jimma town, Ethiopia. The mean age of the respondents was 43.65, 43.48 and 42.73 for large, medium and small scale Holstein Friesian dairy producers and 44.15, 43.24 and 43.07 for crossbreed dairy producers, respectively. Age was not significance ($P>0.05$) among dairy cattle production systems.

The overall mean age value in the study farms (43.29 and 43.49, for Holstein Friesian and crossbreed producers, respectively,) were lower than Belay and Geert (2016) who reported that the mean age value of the respondents were 51.26, in the smallholder dairy farmers of Jimma town, Ethiopia. The results indicated that the large, medium and small scale dairying farming of the study areas were generally run by categories of a productive working age group. These might be due to the active involvement of physical activities required by the farming system to satisfy the scarce input like feed to yield optimum production. In the study farms, majority of the dairy farms are owned by married respondents with an overall percentage value of 68.06 and 66.96 for Holstein Friesian and crossbreed dairy producers, respectively followed by divorced (15.56%) for Holstein Friesian producers and unmarried(16.36%) for crossbreed dairy cattle producers (Table 1).

3.2. Sources of Land Holding Pattern

The source of land holding and land use pattern in the current study areas are presented Table 2. Majority (75%, 42.50% and 76.67%, large, medium and small scale, respectively) of the Holstein Friesian dairy produces had their own sources of land for their dairy farming and only 4.17% of the overall average of the Holstein Friesian producers used a rented land for their dairy farming. Similarly, for the crossbreed dairy producers, majority (75%, 48.89% and 56.79%, for large medium and small scale, respectively) of the respondents had their own sources of land. Comparing to the Holstein Friesian dairy producers, crossbreed dairy producers had lower (3.7%) rented land as a source of dairy farming. The overall land holding average for Holstein Friesian and crossbreed dairy cattle producers were 4.35±11.08 and 3.19±2.64 hectares per householdfor Holstein Friesian and crossbreed producers, respectively. The average land holding was significant ($P<0.05$) between small scale and large and medium scale and non-significant ($P>0.05$) between large and medium scale for both Holstein Friesian and crossbreed dairy producers. In the study areas relatively, large size of land were owned by large and medium scale dairy producers. Comparatively, large scale Holstein Friesian dairy producers had higher land holding than large scale crossbreed dairy producers. The overall land holding per household observed in the study area was higher than that reported, Ayalew (2017) in the rural, peri-urban and urban areas of South Wollo Zone, which were 0.45 hectares. This was due to the large size of milking cows owned by the two systems which need more space for feed storage, the main component of production cost, and a scarce commodity as per the respondents of the interview.

3.3. Educational and Professional Background

Educational and professional background of Holstein Friesian and crossbreed dairy producers are present in Fig 1 and 2. Education is an important opinion for empowerment of communities and an instrument to sustainable development. The role of education is obvious in affecting household income, adopting technologies, demography, health, and as a whole the socio-economic status of the family and the country as well (Adebabay, 2009). For the Holstein Friesian dairy producers, majority (45%, 65% and 53.33%, for large, medium and small scale, respectively) of the respondents had secondary level educational background with an overall percentage value of 54.44. Reasonably, large scale Holstein Friesian dairy producers had higher educational background than the medium and small scale Holstein Friesian producers. Under the Holstein Friesian dairy producers, majority (55%, 67.5% and 36.67%, for large, medium and small scale, respectively) of the respondents had non-agricultural professional background with an overall of 53.0.6%. Comparatively, small scale dairy producers had higher proportion of agricultural backgrounds than large and medium scale producers with percentage value of 63.33, 46 and 32.5, respectively. The overall percentage value (17.22%) college educational background obtained for the Holstein Friesian dairy producers, was lower than the findings of Yusuf (2003) who reported that 24% of the respondents in Harar milk shed area in Ethiopia had college and university education and the findings of Belay and Geert (2016) it was reported that the majority (42.6%) of the farmers had college and university education in the smallholder urban dairy producers in Jimma town, Ethiopia.

Similarly, for the crossbreed dairy producers, majority (45%, 68.89% and 71.6%, large, medium and small scale, respectively) of the respondents had a secondary level educational background with an overall percentage value of 61.83. For the crossbreed dairy producers, large scale dairy producers had higher (45%) a college educational background. Comparing to large scale Holstein Friesian, large scale crossbreed dairy producers had relatively higher college educational background. Majority (55%, 67.67% and 62.96%, large, medium and small scale, respectively) of the professional background of crossbreed dairy producers had a non-agriculture with an overall percentage of 61.87. In the study farms, the overall agricultural professional background of Holstein Friesian dairy producers were higher than the overall agricultural professional background of crossbreed dairy producers.

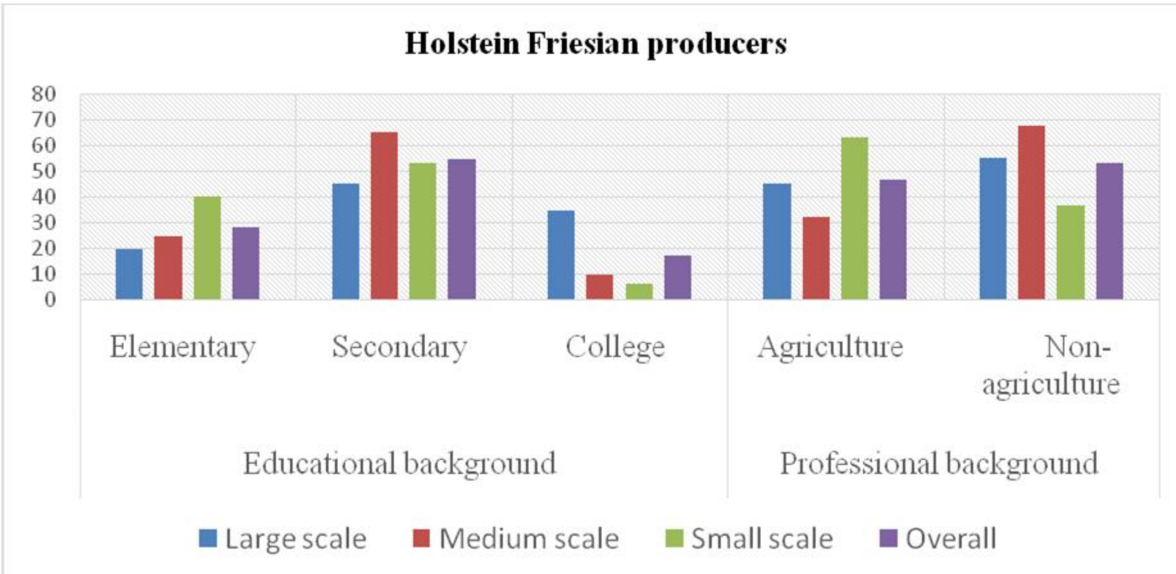

Fig 2. Educational and Professional background of Holstein Friesian dairy cattle producers (%)

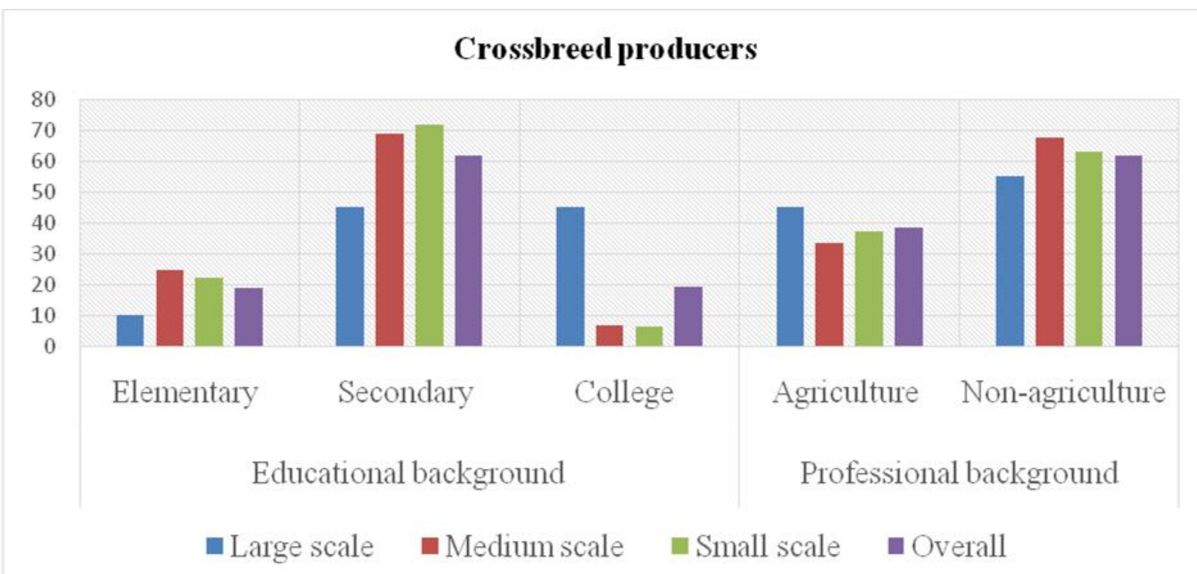

Fig 3. Educational and Professional background of crossbreed dairy cattle producers (%)

3.4. Reproductive Performance of Holstein Friesian and Crossbreed Dairy Cattle

3.4.1 Age at first service

The age at first service of both Holstein Friesian and crossbreed dairy cattle are presented in Table 3. It is the age at which the breeding heifers reach for sexual maturity and accepting mating for the initial period (Belay, 2016).The mean age at first service was 808.96±5.42, 822.72±7.80and 801.75±5.65days, for large, medium and small scale Holstein Friesian dairy producers, respectively with an overall mean value of 811.14±6.29 days. Age at first service was non-significant (P>0.05) among Holstein Friesian dairy producers. The overall age at first service obtained for the Holstein Friesian dairy cattle was lower than Destaw and Kefyalew (2018) who reported the age at first service of HolsteinFriesian dairy cattle at Alage ATVET college, Ethiopia was 31.8±0.44 months and higher than that of Sattar et al. (2005) who found that the age at first service of Holstein Friesian dairy cattle was 714.74 ± 9.72, days in Pakistan. For the crossbreed dairy cattle the age at first service was 824.30±7.11, 871.87±13.46 and 852.57±7.36 days, for large, medium and small scale, respectively with an overall mean value of 849.58±9.3 days. Age at first service was significant (P<0.05) between large scale and the other two crossbreed dairy producers whereas, it was non-significant (P>0.05) between medium and small scale crossbreed dairy producers. The overall age at first service obtained for the crossbreed dairy cattle was higher than that of Emebet (2006) who reported the mean age at first service was 25.6 months in the urban large, medium and small scale dairy productions of Dire Dawa and Belay et al.(2012) who reported the mean age at services for crossbreed dairy of in Jimma Town, Oromia, Ethiopia was 24.30±8.01, months and it was in agreement to the findings of Zewdie (2010) who reported that the age at first service for the cross breed dairy cows in the highlands and central rift valley of Ethiopia was 27.5months.

3.4.2. Age at first calving

The age at first calving of both for HolsteinFriesian and crossbreed dairy cattle are present in Table 3. The mean age at first calving for Holstein Friesian was 1085.01±6.49, 1083.33±5.49 and 1094.63±8.34days for large, medium and small scale Holstein Friesian dairy producers, respectively with an overall mean value of 1077.06±5.66 days. In the study farms, age at first calving was non-significant (P>0.05) among dairy producers. The overall mean age at first calving obtained in the study farms was lower than Destaw and Kefyalew (2018) who reported the overall mean age at first calving for Holstein Friesian dairy cattle at Alage ATVET college, Ethiopia was 42.5±0.46 months. For the crossbreed dairy cattle producers, age at first calving was significant (P<0.05) between large scale and the other two dairy producers whereas, it was non-significant (P>0.05) between medium and small scale crossbreed producers. The mean age at first calving was 1099.62±7.06, 1148.18±13.41and 1128.53±7.37day for large, medium and small scale crossbreed dairy producers, respectively with an overall mean value of 1125.44±9.28 days. The mean age at first calving obtained in this study farms were lower than Iffa etal. (2006) who reported that the mean age at first calving of crossbreed dairy cows in the central highlands of Ethiopia was42.5±0.7 months but, it was in agreement with that of Belay *et al.*(2012) who reported that the age at calving for crossbreed dairy of in Jimma Town, Oromia, Ethiopia was 3.05±0.65 years. In the study farms, relatively Holstein Friesian dairy cows had lower age at first calving comparing to crossbreed dairy cattle (Table 3).

3.4.3. Calving interval

Calving interval is one of the major components of reproductive performance that influences livestock production system.The calving interval of for both the Holstein Friesian and crossbreed dairy cattle are present in table 3. The mean calving interval for Holstein Friesian dairy cattle was 374.41±1.19, 375.02±1.99, and 381.18±2.12 days for large, medium and small scale HolsteinFriesian dairy producers, respectively with an overall mean value of 376.87±1.77 days. Calving interval was significant (P<0.05) between small scale and the other two HolsteinFriesian dairy producers but, it was non-significant (P>0.05) between large and medium scale dairy producers.The overall least square mean of calving interval found in this study was differ from the calving interval of 470.3±9.8 days for Holstein Friesian dairy cows in Alage ATVET college, Ethiopia (Destaw and Kefyalew, 2018) and from the calving interval of 457.5±152.5 days reported for Holstein Friesian cattle in the Hill country of Sri Lanka (Krishantan and Sinniah, 2014).For crossbreed dairy producers, the mean calving interval value was 373.04±2.18, 376.12±1.37and 375.01±2.82 days for large, medium and small scale crossbreed dairy producers with an overall mean value of 374.72±2.12 days. In the study farms there was no significance

(P>0.05) different for calving interval among crossbreed dairy producers. Theoverall mean calving interval of crossbreed dairy cattle in the study farms were lower than the mean calving interval of 13.0±2.1and 13.8±1.9 monthsfor the crossbreed dairy cattle under smallholders management system in Bishoftu and Akaki Towns, Ethiopia, respectively (Dessalegn et al., 2016).

3.4.4. Gestation length

In this study farms, the average gestation length for Holstein Friesian was 274.37±0.39, 271.90±1.94 and 275.31±0.63 days for large, medium and small scale Holstein Friesian producers, respectively, with an overall average of 273.86±0.99 days. For the Holstein Friesian producers, gestation length was significant (P<0.05) between medium scale and the other two Holstein Friesian producers and it was non-significant (P>0.05) between large and small scale Holstein Friesian producers. The mean overall gestation length obtained in this study was lower Sattar (2005) who reported that 278.68±0.29 days gestation length for Holstein friesian cows in Pakistan, buthigher than Juneja et al. (1991) who reported shorter gestation period (266 ± 47.7 days) in Friesian cows in India. In the study farms, gestation length for crossbreed dairy cows was non-significant (P>0.05) among crossbreed dairy producers. The average gestation length was 275.32±0.87, 276.32±0.65 and 275.96±0.65 days, for large, medium and small scale crossbreed dairy producers, respectively with an overall mean of 275.87±0.72 days. The overall gestation length obtained in this study farms were similar to Rokonuzzaman et al. (2009) who reported a gestation length of 275 ±3.95 days for crossbreed dairy cows in Bangladesh.

3.4.5. Days open

Days open is the part of the calving interval, longer days open associated with decreased profitability.The number of days from calving to conception is days open. In the study farms, there was a significant difference (P<0.05) for days open among large scale and the other two Holstein Friesian dairy producers, but there was no significant difference (P>0.05) for Holstein Friesian cows between medium and small scale Holstein Friesian producers. The average days open obtained in this study was 91.24±1.06, 99.75±1.82 and 100.54±2.36 days for large, medium and small scale Holstein Friesian producers, respectively with an overall value of 97.18±1.75 days.

The overall mean Days open obtained in this study farms were lower than Destaw and Kefyalew (2018) who reported 228.2±10.2 day for Holstein Friesian cows in Alage ATVET college, Ethiopia and Hammoud et al. (2010) who reported 130.7 days for Holstein Friesian cows under semi-arid condition in Egypt. For the crossbreed dairy cows, the mean days open was 93.25±1.24, 109.41±2.16 and 106.41±1.69 days for large, medium and small scale crossbreed producers, respectively with an overall mean of 103.02±1.70 days. In the study farms, there was significance difference (P<0.05) among large scale and the other two crossbreed producers and there was no significance difference (P>0.05) between medium and small scale crossbreed dairy producers. The study reveals, the overall days open obtained for the crossbreeds cows were lower than Belay et al. (2012) who reported that 5.19±1.72 months of days open for crossbreed dairy cows in in Jimma town, Oromia, Ethiopia.

3.4.6. Service per conception

The overall average number of service per conception both for Holstein Friesian and crossbreed dairy cows in the present study was 1.51±0.58 and 1.7±0.59, respectively. Service per conception was non-significant (P>0.05) among dairy producers. The overall mean service preconception obtained for Holstein Friesian in this study was higher than the mean service conception of 1.32±0.03 for Holstein Friesian in Alage ATVETCollege, Ethiopia (Destaw and Kefyalew, 2018) and lower than 1.8±0.08 for Holstein Friesian cows in Hossana, Ethiopia (Kebede, 2015). The overall service pre conception obtained for crossbreed dairy cows was lower than Debir (2016) who reported 1.8 of service per conception for crossbreed in Sidama Zone, southern, Ethiopia and Tadesse et al. (2010) who reported 1.81 for crossbreed cows in central highlands of Ethiopia. The result of the study was higher than Belay et al. (2012) who reported 1.56±0.57 of service per conception for crossbreed cows in Jimma Town, Oromia, Ethiopia.

3.5. Production performance of Holstein Friesian and Crossbreed dairy cows.

3.5.1. Daily Milk yield

The reported milk yield of Holstein Friesian and crossbreed dairy are presented in table 4. For Holstein Friesian cows, daily milk yield was significant (P<0.05) between medium and large scale dairy producers whereas, it was non-significant (P>0.05) among the other production systems. The observed daily milk yield was 12.34±0.06, 12.81±0.09 and 12.56±0.09 liters per day for large, medium and small scale Holstein Friesian producers, respectively. The overall observed daily milk yield (12.57±0.08) in this study farms was similar to Amani Z. abdel gaderet al. (2007) who reported a daily milk yield of 12.29±0.28 kg for Friesian cows under Sudan tropical conditions. For the crossbreed cows, daily milk yield was significant (P<0.05) among large scale and the other two crossbreed dairy producer whereas, it was non-significant (P>0.05) between medium and small scale dairy farm. The observed mean daily milk yield was 11.47±0.07, 9.98±0.06, and 9.90±0.10 liters per day, for large, medium and small scale dairy farms, respectively with an overall mean value of 10.45±0.07 liters per day. The overall mean daily milk yield obtained in this study was higher thanBelayet al. (2012) and Adebabay (2009) who reported a daily milk yield of 8.52±3.04 liters per cow for crossbreed dairy cows in Jimma Town, Oromia, Ethiopia and 8 liters for crossbred cows at Bure District, Ethiopia, respectively but, similar to Dessalegn et al. (2016) who reported a daily milk yield of 10.8±2.4 liters per cow per day under smallholders' management system in Akaki Towns, Ethiopia.

3.5.2. Lactation Milk Yield

The average lactation milk yield for Holstein-Friesian cows was 3213.44±35.40, 2844.34±90.66 and 3039.46±74.30 liters per lactation for large, medium and small scale dairy producers, respectively with an overall mean of 3032.41±66.78 liters per lactation. Lactation milk yield was significant (P<0.05) between large and medium scale, but was non-significant(P>0.05) among the other Holstein Friesian. Producers. The overall mean lactation milk yield obtained in this study was similar to Destawet al.(2016)who reported 3078.51±54.74 kg and lower than Amani Z. abdel gaderet al. (2007) who reported a lactation milk yield of 3475.53±78.89 kg for Friesian cows under Sudan tropical conditions.

For crossbreed dairy cows the lactation milk yield was 3007.64±67.19, 3099.09±59.34, and 2634.63±56.11 liters for large, medium and small scale dairy producers, respectively with an overall mean value of 2913.78±61.88 liter per lactation. The observed mean overall lactation milk yield found in these study farms, were lower than 3025, 5807.83±78liter lactation milk yield reported by Dennis (2010) in Kenya and Naceur et al. (2012) in Tunisia, respectively.

3.5.3. Lactation length

The average lactation length for Holstein Friesian dairy cows was 9.32±0.06, 8.49±0.19 and 8.97±0.17 months for large, medium and small scale dairy producers, respectively. Lactation length was significant (P<0.05) among medium scale and the other two Holstein Friesian dairy producers, whereas it was non-significant (P>0.05) between large and small scale dairy producers. The overall lactation length (8.93±0.14 months) obtained in this study farms was lower than Destaw *et al.* (2016) who reported 314.11±4.24 days lactation length for Holstein Friesian cows in Alage and Ardaita ATVET college dairy farm, Oromia region, Ethiopia. For crossbreed dairy cows lactation length was significant (P<0.05) among large scale and the other crossbreed dairy producers, whereas it was non-significant (P>0.05) between medium and small scale crossbreed dairy producers. Theaverage lactation length was 8.76±0.20, 8.09±0.20 and 7.94±0.16 months for large, medium and small scale crossbreed dairy cows, respectively. The overall mean lactation length (8.26±0.19 months) obtained was lower than Belay et al.(2012) *and* Asaminew and Eyasu (2009) who reported a lactation length of 9.13±1.99 months Crossbred Dairy Cows in Jimma Town, Oromia, Ethiopia and 10.1 months for smallholder dairy production in Bahirdar Zuria and Mecha wereda, Ethiopia.

3.6. Breeding goals for Holstein Friesian and crossbreed dairy cattle

Description of the objectives of dairy producers is indispensable in the progress of breeding goals, (Nielsen et al., 2014).The breeding goals of both for Holstein Friesian and crossbreed dairy cows are presented in Fig 3 and 4. For the Holstein Friesian dairy producers, the highest preferenceswere given to improvements in milk production with an index value of 0.45, 0.45 and 0.50, for large, medium and small scale dairy farms, respectively followed by both milk and meat production with an index value of 0.41, 0.38 and 0.37, for large, medium and small scale producers, respectively. Comparatively small scale Holstein Friesian producers had given higher emphasis for milk production than the other two production systems. On the other hand, large scale producers had given second highest preferences for milk and meat production than the other producers. Similarly, crossbreed respondents were highly attached with milk production, both milk and meat production and meat production, respectively as their main breeding goal for their dairy farms. In the study farm, relatively similar proportional emphasis had given for milk production across the crossbreed producers with an index value of 0.50, 0.50, and 0.48, for large, medium and small scale crossbreed producers, respectively.

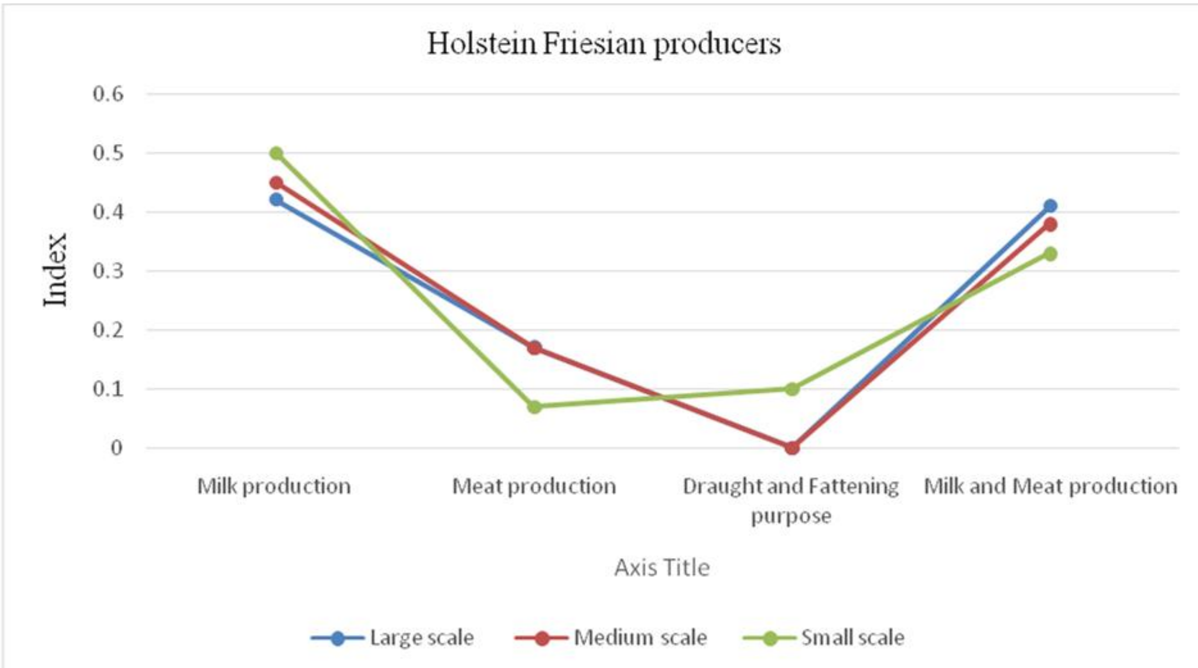

Fig 3. Breeding goals of Holstein Friesian dairy cows

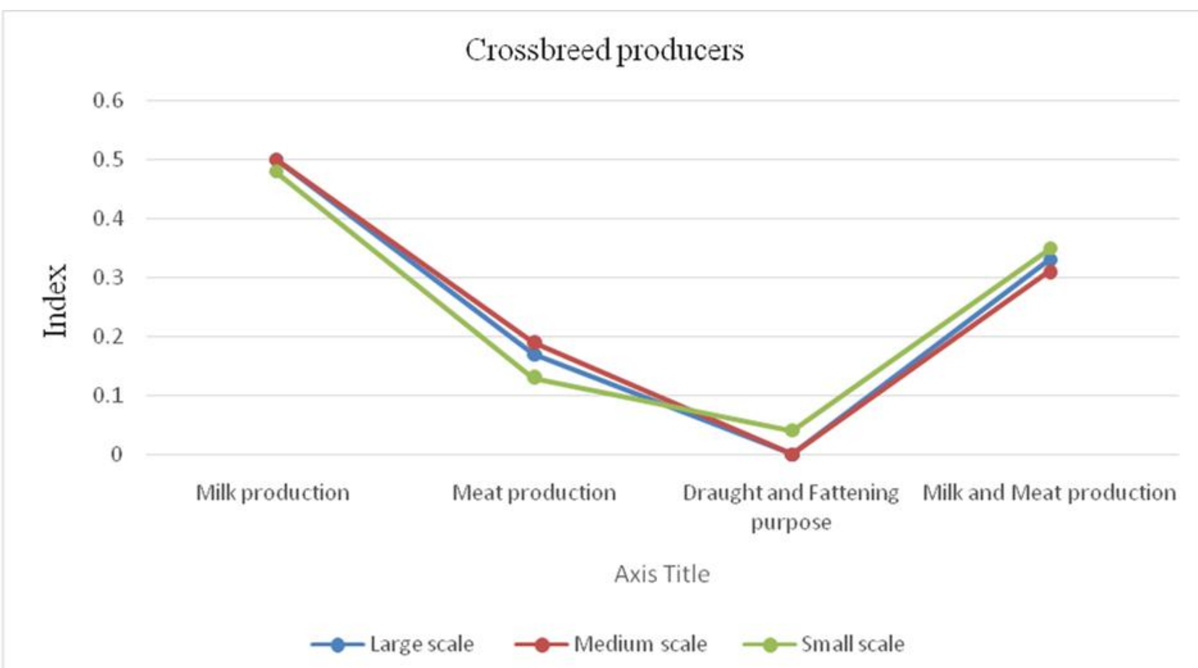

Fig 4. Breeding goals for crossbreed dairy cows

Table 1. Household Characteristics of Respondents

Variable		Holstein Friesian owners				Crossbreed owners			
		Large scale	Medium scale	Small scale	Overall	Large scale	Medium scale	Small scale	Overall
Sex (%)	Male	95.00	82.50	76.67	84.72	95.00	75.56	83.95	84.84
	Female	5.00	17.50	23.33	15.28	5.00	24.44	16.05	15.16
Family size (mean ±SD)		2.4±0.75^{b}	3.20±1.0^{a}	2.17±0.83^{b}	2.59±0.86	2.4±0.75^{b}	3.20±1.5^{a}	2.83±1.29^{ab}	2.81±1.18
Age (mean±SD)		43.65±6.7^{a}	43.48±8.61^{a}	42.73±8.55^{a}	43.29±7.95	44.15±6.15^{a}	43.24±8.58^{a}	43.07±7.94^{a}	43.49±7.56
Household position	HH	60.00	67.50	53.33	60.28	65.00	66.67	66.67	66.11
	SH	30.00	17.50	33.33	26.94	20.00	17.78	17.28	18.35
	SO	10.00	15.00	13.33	12.78	15.00	15.56	16.05	15.54
Marital status	Married	70.00	77.50	56.67	68.06	50.00	75.56	75.31	66.96
	Divorced	20.00	10.00	16.67	15.56	15.00	8.89	9.88	11.26
	Widowed	5.00	7.50	16.67	9.72	0.00	8.89	7.41	5.43
	Unmarried	5.00	5.00	10.00	6.67	35.00	6.67	7.41	16.36

HH= house head, SH= spouse head, SO= son, SD= standard deviation

Table 2. Land holding pattern

Land source and land use type		Holstein Friesian owners				Crossbreed owners			
		Large scale	Medium scale	Small scale	Overall mean	Large scale	Medium scale	Small scale	Overall mean
Source of land (%)	Own	75.00	42.50	76.67	64.72	75.00	48.89	56.79	60.23
	Rent	0.00	12.50	0.00	4.17	0.00	11.11	0.00	3.70
	Squatter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Gifted from family	25.00	45.00	23.33	31.11	0.25	40.00	43.21	27.82
Total amount land (mean±SD)		8.24±27.42^{a}	4.58±5.49^{a}	0.22±0.33^{b}	4.35±11.08	4.40±2.06^{a}	4.71±5.42^{a}	0.45±0.43^{b}	3.19±2.64
Land for crop (mean ±SD)		0.64±1.76^{b}	2.83±3.64^{a}	0.19±0.28^{b}	1.22±1.89	2.35±1.08^{a}	2.99±3.58^{a}	0.43±0.42^{b}	1.92±1.69
Land for forage (mean ±SD)		0.48±2.00^{b}	1.35±2.07^{a}	0.00^{b}	1.22±1.36	0.28±0.55^{b}	1.27±1.98^{a}	0.00^{b}	1.03±0.84
Land for grazing (mean ±SD)		4.00±17.89^{a}	0.05±0.22^{b}	0.00^{b}	1.35±6.04	0.00^{a}	0.09±0.34^{a}	0.00^{a}	0.03±0.11
Land for hay conservation (mean ±SD)		2.41±8.88^{a}	0.35±0.86^{b}	0.02±0.10^{b}	0.93±3.28	1.68±1.13^{a}	0.36±0.83b^{a}	0.01±0.04^{b}	0.68±0.67

SD= standard deviation, *means with the same letters are not significantly different

Table 3. Reproductive performances of Holstein Friesian and crossbreed dairy cattle

Variable	Holstein Friesian dairy cattle				Crossbreed dairy cattle			
	Large scale	Medium scale	Small scale	Overall	Large scale	Medium scale	Small scale	Overall
	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE
Age at first service (days)	808.96±5.42[a]	822.72±7.80[a]	801.75±5.65[a]	**811.14±6.29**	824.30±7.11[b]	871.87±13.46[a]	852.57±7.36[a]	849.58±9.31
Age at first calving (days)	1083.33±5.49[a]	1094.63±8.34[a]	1077.06±5.66[a]	**1085.01±6.49**	1099.62±7.06[b]	1148.18±13.41[a]	1128.53±7.37[a]	1125.44±9.28
Calving interval (days)	374.41±1.19[b]	375.02±1.99[b]	381.18±2.12[a]	**376.87±1.77**	376.12±1.37[a]	373.04±2.18[a]	375.01±2.82[a]	374.72±2.12
Gestation length (days)	274.37±0.39[a]	271.90±1.94[b]	275.31±0.63[a]	**273.86±0.99**	275.32±0.87[a]	276.32±0.65[a]	275.96±0.65[a]	275.87±0.72
Days open (days)	91.24±1.06[b]	99.75±1.82[a]	100.54±2.36[a]	**97.18±1.75**	93.25±1.24[b]	109.41±2.16[a]	106.41±1.69[a]	103.02±1.70
SPC (number)	1.16±0.5[a]	1.75±0.67[a]	1.63±0.56[a]	**1.51±0.58**	1.85±0.59[a]	1.68±0.56[a]	1.57±0.61[a]	1.7±0.59

SE= standard error, SPC=service per conception, AI=artificial insemination *Means with the same letters are not significantly different

Table 4. Production performance of Holstein Friesian and crossbreed dairy cows

Variable	Holstein Friesian				Crossbreed			Overall
	Large scale	Medium scale	Small scale	Overall	Large scale	Medium scale	Small scale	
	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE
DMY	12.34±0.06[b]	12.81±0.09[a]	12.56±0.09[ab]	12.57±0.08	11.47±0.07[a]	9.98±0.06[b]	9.90±0.10[b]	10.45±0.07
LL	9.32±0.06[a]	8.49±0.19[b]	8.97±0.17[a]	8.93±0.14	8.76±0.20[a]	8.09±0.20[b]	7.94±0.16[b]	8.26±0.19
TMY/L	3213.44±35.40[a]	2844.34±90.66[b]	3039.46±74.30[ab]	3032.41±66.78	3007.64±67.19[a]	3099.09±59.34[a]	2634.63±56.11[b]	2913.78±61.88

SE= standard error, DMY=daily milk yield, LL=lactation length, TMY/L= total milk yield per lactation

4. Conclusion and Recommendation

Dairy productions are important, where they help to safeguard the large difference between milk demand and supply. Reproductive and productive performance information is a prerequisite for dairy cattle genetic improvement. It is concluded that the productive and reproductive performances obtained both for Holstein Friesian and crossbreed dairy cattle were below the expected standards. The study demonstrated that appropriate management practices make a difference to the income and benefits for ensuing dairy cattle producers.

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6. References

Abebe Bereda, Zelalem Yilma and Ajebu Nurfeta. 2014. Dairy Production System and Constraints in Ezha Districts of the Gurage Zone, Southern Ethiopia Global Veterinarian 12 (2): 181-186, 2014

Adebabay Kebede Belew. 2009. Characterization of milk Production Systems, Marketing and On-Farm Evaluation of the effect of Feed Supplementation Milk yield and Milk Composition of Cows at Bure District. Ethiopia a Thesis Submitted to the Department of Animal Science and Technology School of Graduate Studies Bahir Dar University.

Amani Z. abdeL gader, Mohamed-khair A. ahmed, Lutfi M. A. Musa and Kurt J. peters. 2007. Milk yield and reproductive performance of Friesian cows under Sudan tropical conditions. Arch. Tierz., Dummerstorf 50 (2007) 2, 155-164

Asaminew and Eyasu. 2009. Smallholder dairy system and emergency of dairy cooperatives in Bahir dar Zuria and Mecha Woredas, northern, Ethiopia. World J. Dairy and Food Sci., 4(2): 185-192.

Asimwe L, and Kifaro G .C. 2007**.** Effect of breed, season, year and parity on reproductive performance of dairy cattle under smallholder production system in Bukoba district, Tanzania. Livestock Research for Rural Development. Volume 19,

Ayalew Mekonnen. 2017. Milk Production, Handling, Processing and Marketing in three Dairy Production Systems of South Wollo Zone, Amhara National Regional State, Ethiopia M.Sc. Thesis.

Behnke, R. 2010. The Contribution of Livestock to the Economies of IGAD Member States: Study Findings, Application of the Methodology in Ethiopia and Recommendations for Further Work. UK: Odessa Centre, IGAD Livestock Policy Initiative, Great Wolford; IGAD LPI Working Paper 02-10

Belay D .L. 2016. A Review on Dairy Cattle Breeding Practices in Ethiopia, South Agricultural Research Institute (SARI), Hawassa Agricultural Research Center, Hawassa, Ethiopia. Journal of Biology, Agriculture and Healthcare 6: 121-128.

Belay Duguma and Geert P.J. Janssens. 2014. Smallholder Milk Processing and Marketing Characteristics at Urban Dairy Farms in Jimma Town of Oromia Regional State, Ethiopia. Global Veterinaria 13 (3): 285-292, 2014

Belay Duguma and Geert P.J. Janssens. 2016. Smallholder Dairy Farmers' Breed and Cow Trait Preferences and Production Objective in JimmaTown, Ethiopia. European Journal of Biological Sciences 8 (1): 26-34, 2016.

Belay Duguma, Yisehak Kechero and G.P.J. Janssens. 2012.Productive and Reproductive Performance of Zebu X Holstein-FriesianCrossbred Dairy Cows in Jimma Town, Oromia, Ethiopia. Global Veterinaria 8 (1): 67-72, 2012, ISSN 1992-6197.

Berihulay Haile and Mekash Yoseph. 2018. Reproductive Performance of Holstein Friesian Dairy Cows at Alage Dairy Farm, Ethiopia. Journal ofDairy & Veterinary Sciences. ISSN: 2573-2196

CSA (Central Statistical Agency). 2008. Summary and statistical report of the 2007population and housing census, Addis Ababa, Ethiopia. 114pp

CSA (Central Statistical Agency). 2013. Federal Democratic Republic of Ethiopia, Central Statistical Agency, Addis Ababa, Ethiopia. Population projection of Ethiopia for the year 2014; pp 4-38.

Dennis K. 2010. Evaluation of the constraints to profitable smallholder Dairying: A case of Nakuru County, Kenya, MSc, thesis Egerton University.

Dessalegn Genzebu, Berhan Tamir and Gebreyohanes Berhane. 2016. Study of productive and reproductive performance of cross breed dairy cattle under smallholders' management system in Bishoftu and Akaki Towns. International Journal of Agricultural Sciences ISSN 2167-0447 Vol. 6 (2), pp. 913-917.

Destaw Worku Mengistu and Kefyalew Alemayehu Wondimagegn. 2018. Evaluation of the reproductive performance of HolsteinFriesian dairy cows in Alage ATVET College, Ethiopia.International Journal of Livestock Production Vol. 9(6), pp. 131-139, June 2018.

Destaw Worku, Kefyalew Alemayehu and Mussie H. Melekote.2016. Comparative Milk Production Performance Evaluationof Holstein Friesian Cattle Breeds in the Two Different AgroEcological Systems: The Case in Alage and Ardaita Atvet CollegeDairy Farm, Oromia Region, Ethiopia. Advances in Biological Research 10 (5): 295-303, 2016

Emebet Moreda. 2006. Reproductive performance of dairy cows under urban dairy production systems in Dire-Dewa, Ethiopia. Ans. M.Sc. thesis Presented to the Department of Animal Sciences, School of Graduate Studies of Haramaya University

Gatwech Tang. 2012. Dairy production, Processing and Market System: A case Study of Gambella, South West Ethiopia. Thesis submitted to the school of Graduate Studies of Addis Ababa University in partial fulfillment of the requirements for the Degree of Master of Science in Tropical Animal Production and Health

Hammoud MH, El-Zarkouny SZ, Oudah E.Z.M. 2010. Effect of sire, age at first calving, season and year of calving and parity on reproductive performance of Friesian cows under semiarid conditions in Egypt. Archiva Zootechnica 13(1):60-82.

Iffa K, Hegde BP, Kumsa T. 2006. Lifetime production and reproduction performances of Bos taurus x Bos Indicus crossbred cows in the Central Highlands of Ethiopia. Eth. J. Anim. Prod., 6(2):37-52.

IPMS (Improving Productivity and Market Success). 2005. Ethiopian Farmers Project Working Paper 9, ILRI (International Livestock Research Institute), Nairobi, Kenya. P 62.

Kibrom, G. 2005. Investigation into engineering properties of Mekele soils with an emphasis on expansive soils. MSc Thesis, Addis Abeba University, Ethiopia

Kiwuwa, G.H., J.C.M. Trail, M.Y. Kurtu, G. Worku, F. Anderson and J. Durkin. 1983. Crossbreed dairy cattle productivity in Arsi region, Ethiopia. ILCA Research Report 11. International Livestock Centre for Africa, pp: 1-29.

Krishantan G, Sinniah J. 2014. Productive and Reproductive Performance of Holstein Friesian Cattle in the Hill Country of Sri Lanka. Global Vet. 13(1):87-94.

Krishantan G. and Sinniah J. 2014. Productive and Reproductive Performance of Holstein Friesian Cattle in the Hill Country of Sri Lanka. Global Vet. 13(1):87-94.

Naceur M, Bouallegue M, Frouja S, Ressaissi Y, Kaur Brar S, Ben Hamouda M. 2012. Effects of Environmental Factors on Milk Yield, Lactation Length and Dry Period in Tunisian Holstein Cows, Milk Production -An Up-to-Date Overview of Animal Nutrition, Management and Health, Prof. Narongsak Chaiyabutr (Ed.), ISBN: 978-953-51-0765-1.

Nielsen, H. M.and Amer, P.R. 2007. An approach to derive economic weights in breeding objectives using partial profile choice experiments. Animal, 1(9), 1254–1262.

Melese B, Dutamo Z. 2015. Statistical Analysis of Road Traffic Car Accident in Dire Dawa Administrative City, Eastern Ethiopia. Science Journal of Applied Mathematics and Statistics, 3: 250-256.

Metaferia F., Cherenet, T., Gelan, A, Abnet, F., Tesfay A., Ali, J.A, Gulilat. W. 2011. A Review to Improve Estimation of Livestock Contribution to the National GDP. Ministry of Finance and Economic Development and Ministry of Agriculture. Ethiopia: Addis Ababa; 2011.

Mukasa-Mugerwa, E. 1989. A review of reproductive performance of the Female Bos-indicus (zebu) cattle. ILCA. Monograph 6. ILCA (International Livestock Research Institute) AddisAbaba, Ethiopia. p134.

Mumed A, Eshetu A. 2015. A Cross Sectional Study on Prevalence of Cephalopina titillate or Infection in Camel (Camelus dromedaries) in Dire Dawa Administrative Region, Ethiopia. Advances in Biological Research, 9: 225-229.

Perera, O. 1999. Management of reproduction. 241-264pp. In: small holder dairying in the tropics. ILRI (International Livestock Research Institute), Nairobi, Kenya. p 462

Peters A and Ball P.J. 1995. Reproduction in Cattle. (2nd edn), Blackwell Science Ltd. p. 1-75.

Rokonuzzaman, M., Hassan, M. R., Islam, S. And Sultana S. 2009. Productive and reproductive performance of crossbred and indigenous dairy cows under smallholder farming system. J. Bangladesh Agril. Univ. 7(1): 69–72, 2009

SAS (Statistical Analysis System). 2008.SASforwindows,Release9.2.User's Guide.SASInstitute,Inc.,Cary,NC,USA.

Sattar, A., Mirza, R. H., Niazi A. A. K. and Latif, M. 2005. Productive and Reproductive Performance of Holstein Friesian Cows in Pakistan Pakistan. Vet. J., 25(2): 2005 75

Sattar, A., Mirza, R. H., Niazi, A. A. K. and Latif, .M. 2005. Productive and Reproductive Performance of Holstein FriesianCows in Pakistan. Research Institute for Physiology of Animal Reproduction, Bhunikey (Pattoki), Distt. Kasur, Pakistan-55300. Pakistan Vet. J., 25(2): 2005

Tadesse M, Thiengtham J, Pinyopummin A and Prasanpanich S. 2010. Productive and reproductive performance of Holstein Friesian dairy cows in Ethiopia. Livestock Research for Rural Development 22 (2)

Tadesse, B. 2002. Reproductive performances of zebu (Fogera) breed in the central highlands of Ethiopia. DVM thesis, Addis Ababa University,

Yoseph, S. Tenhagen, B.A., Merga, B and Tesfu, K. 2003. Reproductive Performance of Crossbred Dairy Cows Managed Under Different Production Systems In Central Highlands of Ethiopia. *Tropical Animal Health and Production* 35 (6): 551-561.

Yousuf Kurtu. 2003. Certain aspects of the dairy systems in the Harar milk shed, Eastern Ethiopia University of the Free State Bloemfontein, South Africa. (Ph.D. Dissertation).

Zelalem Y. 2012. Microbial Properties of Ethiopian Marketed Milk and Milk Products and Associated Critical Points of Contamination: an Epidemiological Perspective, Epidemiology Insights, Dr. Maria De Lourdes Ribeiro De Souza Da Cunha (Ed.), ISBN: 978-953-51-0565-7.

Zewdie W. 2010. Livestock Production Systems in Relation with Feed Availability in the Highlands and Central Rift Valley of Ethiopia. MSc. Thesis, Haramaya University, Ethiopia.

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