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Reproductive and Productive Performance of Crossbred Dairy Cows (Zebu × HF) Under Small and Medium Scale Dairy Farmers Management System in Amanuel Town, Ethiopia

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Abstract
Evaluations of the productive and reproductive performances of crossbred dairy cows were carried out in Amanuel town Ethiopia under small scale and medium scale dairy farms. To collect data from 102 (60 small and 42 medium) dairy scale farms, a cross- sectional study were employed via structured questionnaires. To assess the reproductive performance of the dairy cows, age at first services (AFS), age at first calving (AFC), days open (DO), calving interval (CI), number of service per conception (NSPC) were utilized as an indicator traits. In addition, lactation milk yield (LMY) and lactation length (LL) were considered as an indicator of the productive performance traits. To study the variation on the measured traits the collected data were analyzed using SPSS Version 20. As reported by the respondents, the overall mean value of AFS, AFC, DO, CI and NSC were 16.46 ± 0.35 months, 25.43 ± 0.36 months, 81.62 ± 0.26 days, 12.95 ± 0.20 months and 1.81 ± 0.048, respectively and their LL and LMY were 7.49 ± 0.13 months, 1685.95 ± 8.50 litres, respectively. There was significant difference ($p<0.1$) between small and medium scale dairy farm in AFS and LMY. Managemental differences (shortage of feed, inadequate health care, weak AI service, poor market linkage) are the major limitations for low productivity of both small and medium scale dairy farms in the sample area.
Keywords: Crossbred, Reproductive and productive traits, Small and medium scale dairy farms
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INTRODUCTION

Ethiopia is known for its huge cattle population and livestock sector contributes significantly to the national economy. The total cattle population of the country is estimated to be about 59.5 million. Out of this total cattle population, the female cattle constitute 55.5 percent and the remaining 44.5 percent were male cattle (CSA, 2016/17). From a total cattle population around 98.20 percent were local, 1.62 percent crossbred and 0.18 percent exotic breeds. Previous studies showed that, the livestock sector contributes about 12-16% of national GDP, 30-35% of agricultural GDP, 15% of export earnings and 30% of agricultural employment. Moreover, livestock contribute to the livelihoods of 60-70% of the population (Zijlstra *et al*., 2015).

Despite the largest local breed cattle population in Ethiopia, particularly dairy cows production performances were low. According to CSA (2016/17), the average lactation period per cow at country level was estimated to be about six months and average milk yield per cow per day was 1.37 liters. In Ethiopia, such a lower milk production performance is due to reduced lactation length, extended calving interval, late age at first calving and poor genetic makeup (Azage *et al*., 2010). Another problem is shortage of livestock feeds both in quantity and quality, especially during dry season (Zewdie, 2010). In general shortage of supply of dairy products requires the country to spend hard currency to import dairy products from abroad (Azage *et al*., 2013).

In addition to the production performance, the reproductive performances of the breeding females were very low. Since, reproductive performance is probably the single most important factor that is a prerequisite for sustainable dairy production system and influencing the productivity (Fikire *et al*., 2007). In view of the fact that, the size of the calf crop is all important for herd replacement and the production of milk depends heavily on the cow's reproductive activity (Kiwuwa *et al*., 1983).

As a result low production performance in the country's leads to; low per capita milk consumption, it was estimated to be about 19.2 kg per year compared with other East African countries like Kenya (80 kg/annum). While the world recommendation by FAO 200 kg/annum (Njombe *et al*., 2011), which is far below the average per capita consumption of Africa, 37.2 kg per year (FAO, 2000). Like most developing countries, human population growth in Ethiopia (estimated to be increase at a rate of 3% annually, urbanization and rising household incomes are leading to a substantial increase in the demand for livestock products, particularly milk and meat (Mohammed *et al*., 2004). In order to meet the growing demand for dairy product, milk production has to grow at least at a rate of 4% per annum (Azage *et al*., 2001).

Genetic improvement of the indigenous cattle, basically focusing on crossbreeding, has been practiced in many developing countries, as a one mechanism to improve dairy productivity (Mason IL, 1974). In Ethiopia,

crossbred cattle mainly cross of zebu with Holstein- Friesian cattle have been used for milk production for decades. Previous studies have shown that crossbred animals have better reproductive and productive performances compared with indigenous stock (Yoseph *et al*., 2003). Consequently, the most suitable cows for dairy production in these areas are ones with a proportion of genes from high-producing cattle of temperate origin and a proportion from well-adapted but low-producing cattle, in many cases a Bos Taurus× Bos indicus cross, often with the advantages of heterosis (Albero, 1983).

According to Ethiopia livestock master plan (2015), the expected increase in number of crossbred cattle for improved family dairy systems, in the mixed crop-livestock rainfall sufficient zone during the Growth and Transformation Plan (GTP II) by 2020 will be 3.6 million. To improve dairy production, with the adoption of the intervention during the GTP II, crossbred dairy cattle will produce an average of 6 liters of milk per day as compared to 1.9 for local cattle milk (an increase of 216 percent), weight 375 kg, while the average live-weight of local adult animals is 280 kg, have a lactation period of 270 days on average as compared to 200 days for local breeds (an increase of 35 percent) and produce an average of 1053 liters of milk per year as compared to 247 for local breeds (a 326 percent increase).

To put in place appropriate remedial interventions that would lead to enhanced productivity of the dairy subsector, understanding the prevailing overall reproductive and productive performance and other dairy cow's related production constraint is very vital. This necessitates the need for generating site specific database under specific production scenarios. In this regard, little research has been done so far to identity the overall reproductive and productive performance and other crossbred dairy cow's related production constraint in East Gojjam Zone. In this research, it is endeavored to fill this existing information gap. Hence, the aim of this study was to evaluate on reproductive and productive performance of crossbred dairy cows' and related management practice and to suggest possible solutions for the identified limitations at their production environment in Amanuel town East Gojjam Zone.

MATERIALS AND METHODS

Location and Description of the Study Area

The study was conducted in Machakel district Amanuel Town, East Gojjam zone, Amhara National Regional State, Ethiopia. The district is located 236 km far from Bahir Dar and 316 Km from Addis Ababa. The area is located at 10^0 40' N latitude and 37^0 20' E longitudes at an altitude of 1200-3200 masl. Its annual rain fall ranges from 900-1800 mm receiving from May to mid-October with the remaining months being the dry season. The mean annual temperature is 17.5°C (MDAO, 2016).

Methodology

This study focused on cross-sectional survey method intended to assess reproductive and productive performance of crossbred dairy cows.

Sampling method

From Machackle district specifically Amanuel town were selected based on crossbred dairy cow's population, its potential for milk production and other characteristics of herd management. Accordingly those farmers who have crossbred milking dairy cows' were clustered in to small and medium scale dairy farms. The classification were as flows: farms owning less than 3, 3-10 and >10 dairy cows to small scale dairy farm (SSDF), medium scale dairy farm (MSDF) and large scale dairy farm (LSDF), respectively (ILRI, 1996; Nigusu and Yoseph, 2014). Since, there were no representative sample for large scale dairy farm in the study area only small and medium scale dairy farms were considered for this study.

By applying sample size determining formula of (Krejcie and Morgan, 1970) as follows:

$$S = \frac{x2NP(1-p)}{d2(N-1) + X2P(1-P)}$$

Where:

S = Required Sample size
X = Z value (e.g. 1.96 for 95% confidence level)
N = Population Size
P = Population proportion (expressed as decimal) (assumed to be 0.5 (50%)
d = Degree of accuracy (5%), expressed as a proportion (.05); It is margin of error

To conduct the survey out of 138 households/dairy farms in Amanuel town 102 (60 small and 42 medium scale) dairy farms were selected by simple random sampling methods using the above formula.

Data collection method

Both small and medium scale dairy farms were used to gather information about the perceptions of farming practices, livelihoods and their opinion about the production and reproduction performances of crossbred cows

where they have been beneficiaries in their own production system. A team of enumerators assigned and trained for the survey with close supervision by the researcher. Data were collected through interviews with household heads using a detailed, pre-tested questionnaire, which was previously developed and checked for clarity of the questions prior to the interview and respondents were briefed on the objective of the study. For this study the questionnaire was adapted according to prevailing circumstances before data collection.

Raw data like farming constraints, reproductive and production performance of crossbred dairy cows (AFS, AFC, DO, CI, NSPC, daily milk yield, MY/L, LL, milk yield in 3 stage of lactation and longevity were collected through both closed and open ended questions allowing multiple responses in some cases. The selected farmers do have crossbred dairy cows of genotype from 50% - 75%. Lactating of crossbred cows was stratified based on their lactation stage as early (1-3 months), mid (4-6 months) and late (7-9 months) stages of lactation.

In addition secondary data were used like; certificate given for the identification of crossbred animal from ranch, research and AI center for their exotic blood level of Sire/Bull used. This data were collected by 7 enumerators who were veterinary officer, AI technician and development agents/DA from district livestock office; field work was conducted from August 2017 to January 2018.

Survey Data Management and Statistical Analysis

Questionnaire data which were gathered during the study was checked for any error, coded and entered in to computer for further analysis. Collected data through questionnaire were described by statistical package for social sciences (SPSS version 20). Qualitative and quantitative data from the cross-sectional survey was entered in to Microsoft Office Excel 2007. Data was transported and analyzed using the statistical package for social sciences SPSS version 20.0, (SPSS, 2007) software. Descriptive statistics such as, means, standard deviation or standard errors, frequency distribution and percentages was used. Mean comparison was done using the least significant difference (LSD) for variables whose F values showed a significant difference. Differences were considered statistically significant at 5% level of significance.

Ranking analysis was undertaken hence, in the preference ranking method, index was compute with the principle of weight average using auto ranking with MS-excel 2007. The formula was used to compute index as variable with the highest index value is ‘’’the highest economically important (Kosgey, I .S. 2004). Index =Σ (n x number of HHs ranked 1st) + (n-1) x number of HHs ranked 2nd) + …+ 1 x number of HHs ranked last) for one trait divided by the Σ (n x number of HHs ranked 1st+ (n-1) x number of HHs ranked 2nd+…. +1x number of HHs ranked last) for all traits. Where; n = number of traits under consideration.

The following linear models were used during analysis of quantitative survey data:

Model statement regarding the effect of different fixed effects on various performances

Parameters of crossbred dairy cows

$Yik = \mu + Ai + \varepsilon ik$ Where

Yik= is the cows’ performance parameters estimate for cow i in small and medium scale dairy producer.

μ= is the overall mean,

Ai = is fixed effect of farm scale that affects performance of cows (i=small and medium)

εik = is the residual error.

RESULTS AND DISCUSSION

Reproductive Performance of Crossbred Dairy Cows

Age at First Service (AFS)

As indicated in Table 1, age at first service in the present study was reported by the respondents as 17.2 ±0.49 and 15.46 ± 0.46 months in SSDF and MSDF, respectively with overall mean 16.46 ± 0.35 months. These results had statistically significant difference ($p<0.05$), between farm scale (SSDF and MSDF). This difference might be due to their management practice, their cattle blood level difference, calves feeding system and supplementation of concentrate feed to their cow on basal feed resources.

The current result was lower than the previous study (AFS) report of Yoseph *et al*. (2003) 29.6 months in the central high lands of Ethiopia, Belay et al. (2012) 24.30 ± 8.01 months in Jimma Oromia region, Yoseph *et al*. (1999) 20.1 months in Addis Ababa milk shed, Melku (2016) for crossbred of 25%, 50% and 75% was; 34.56 ± 6.64, 28.80 ± 5.48 and 25.20 ± 4.88 months, respectively with overall average 29.52 ± 3.96 months in West Gojjam Zone Amhara region and Megersa (2016) for crossbred of < 50%, 50-75% and >75% was; 37.98, 21.88 and 20.64 months, respectively with overall average 26.83 months in West Shoa Zone Oromia region. However, the present result was higher than the general crossbred dairy cows report by Shiferaw *et al.* (2003) 11.75 months in the central Highlands of Ethiopia, Mureda and Mekuriaw (2007) 13.5 months in Eastern Lowlands of Ethiopia and Ibrahim (2011) 13.75 months in Gondar town Amhara region. But, it was comparable with the report of Nibret (2012) 15.4 ± 5.1 months in and around Gondar.

Age at First Calving (AFC)

In this study age at first calving was reported by the respondents as 26.2 ± 0.50 and 24.36 ± 0.46 months in SSDF and MSDF, respectively with overall mean of 25.43 ± 0.34 months as indicated in Table 1. This result was comparable with the previous report of Niraj *et al*. (2017) 26.5 ± 2.5 months in and around Debre Zeit, Ethiopia. But, it was lower than the report of Nibret (2012) 32.4 months under smallholder conditions in and around Gondar, Hunduma (2012) 34.8 ± 4 months under smallholder conditions in Asella town Oromia region, Megersa (2016) for crossbred of < 50%, 50-75% and > 75% as 46.79, 31.27 and 29.56 months, respectively with overall average 35.87 months in West Shoa Zone Oromia region, Melku (2016) for crossbreed of 25%, 50% and 75% was; 46.56 ± 5.92, 39.72 ± 6.04 and 36.36±4.56 months, respectively with overall average of 40.88 ± 5.51 months in West Gojam Zone, Amhara region, Belay et al. (2012), 3.05 ± 0.65 years in Jimma Oromia region, Mureda and Mekuraiw (2007) 36.2 months in Eastern Lowlands of Ethiopia, Ibrahim et al. (2011) 34.7 months in Gondar town Amhara region and Shiferaw *et al*. (2003) 40.6 months under different production systems in central highlands of Ethiopia.

Days Open (DO)

The average days open in this study was reported by the respondents as 85.0 ± 0.40 days and 76.78 ± 0.29 days in SSDF and MSDF, respectively with overall average 81.62 ± 0.26 days as indicated in Table 1. This result was lower than the previous report of crossbred dairy cows by Belay et al. (2012) 5.19 ± 1.72 months in Jimma town Oromia region, Megersa (2016) for crossbred of < 50%, 50 - 75% and > 75% was 187.2, 90.82 and 89.3 days, respectively with overall average for all crossbred 122.4 day in West Shoa Zone Oromia region, Melku (2016) crossbreed of 25%, 50% and 75% was; 112.80 ± 42.00, 109.80 ± 54.00 and 103.50 ± 36.00 days, respectively with overall mean 108.70 ± 11.00 days in West Gojam Zone Amhara region and Tadesse *et al*. (2010) 148 ± 1.72 days in Holeta for general crossbred dairy cows.

But, it was comparable with the previous study report of Nibret (2012) 2.9 ± 3.7 months in and around Gondar North Western Amhara region and Hunduma (2012) 85.6 ± 5.6 days in Asella town Oromia region. This study report ranges within the recommended standards by Malik (1977) as he stated that, "days open" period should not exceed 80-85 days if a calving interval of 12 months is to be achieved; this period requires for re-establishment of ovarian activity soon after calving and high conception rates. The duration of days open is influenced by nutrition, season, milk yield, parity, suckling and uterine involution (Dessalegn *et al*., 2016).

Calving Interval (CI)

The calving interval in the present study was reported by the respondents as 13.208 ±0.28 months in SSDF and 12.57 ± 0.27 months in MSDF with overall average of 12.95 ± 0.20 months as indicated in Table 1. This result was lower than previous study report by Shiferaw *et al*., (2003) 487 days (16.23 months) in crossbred dairy cows in different production systems in the central Highlands of Ethiopia, Melku (2016) for crossbred of 25%, 50% and 75% was 17.52 ± 4.36, 16.30 ± 2.59 and 15.70 ± 3.21 months, respectively with overall mean 16.51 ± .3.39 months in West Gojam Zone Amhara region and Belay *et al*. (2012) 21.36 ± 3.84 months in Jimma town Oromia, region.

But, it was comparable with the previous study report of Hunduma (2012) 372.8 days (12.43 months) in crossbred dairy cows under smallholder condition in Asella town, Megersa (2016) crossbred of < 50%, 50-75% and > 75% was 466.8, 429.23 and 417.07 days, respectively with overall average 417.8 days (13.92 month) in West Shoa Zone Oromia region, Nigusu and Yoseph (2014) 13.6 months in Adama milk shed and Nibret (2012) 13.4 ± 5.1 months in and around Gondar North Western Ethiopia. The average calving interval obtained in this study, were within the range satiated by Kiwuwa *et al*. (1983) as they reported that, 12 to13 months of calving interval were considered acceptable period for crossbred dairy cows.

This acceptable calving interval might be due to the farmers good feeding practice; since, almost all of the respondents depend on locally produced brewery by products (Birint and Athella) as supplementary feed resources. Locally produced brewery by products was available throughout the year (with less seasonal fluctuation). So that, in the study area there was good feed availability in quantity and quality in relative to seasonal dependant feed resources. Since, poor feeding practices adversely affect the synthesis and secretion of hormones responsible for ovarian follicular development and function leading to extended calving intervals in these cows (Thatcher et al., 2008). It is more, profitable to have one calf yearly in cattle. If the calving interval is longer than this result, the total number of calving and also total life time milk production will be low in cow's life time.

Number of service per conception (NSC)

Number of service per conception in the current study result was reported by the respondents as 1.81 ±0.04 as indicated in Table 1. The current result was comparable with the previous report of Tadesse *et al*. (2010) 1.8 in the highlands of Ethiopia, Megersa (2016) for crossbred of 50-75% was 1.8 in West Shoa Zone Oromia region

and Lobago *et al*. (2007) 1.7 in the highlands of Ethiopia. However, it was higher than mean value of crossbred dairy cows reported by Nibret (2012) 1.3 in Gondar city, Hunduma (2012) 1.52 in Assela town Oromia region, Belay *et al*. (2012) 1.56 in Jimma town Oromia region, Melku (2016) for crossbreds of 25%, 50% and 75% was; 1.67 ± 0.61, 1.71 ± 0.40, 1.51 ± 0.34 and 1.66 ± 0.41, respectively with overall mean 1.63 ± 0.38 in West Gojam Zone Amhara region, Shiferaw *et al*. (2003) 1.62 in different production system in the central Highlands of Ethiopia and Yifat *et al.* (2009) 1.67 under smallholder conditions in and around Zeway, Ethiopia.

Higher mean value was reported by Negussie *et al*. (1998) 2.0 in Asella livestock farm Arsi, Ethiopia and Megersa (2016) for crossbred of <50 was 3.13 in West Shoa Zone Oromia region. The differences could be attributed to differences in management practices and agro-ecology of the respective areas, appropriate and timely heat detection, quality of semen and properly insemination are among major factors to lower or higher number of service per conception (Yifat *et al*., 2009).

Number of calves born per cow life time

Average number of calves born and productive life of cows were reported by the respondents as 7.12 ± 0.12 and 11.00 ± 0.21 years, respectively as indicated in Table 1. This result shows there was no significant difference ($p > 0.05$) between farm scales (SSDF and MSDF) both in number of calves born and productive life of cows. Longevity of cows in this study was somehow comparable with crossbred cows of < 50%, 50-75% and >75% as 11.96, 10.43 and 9.17 years, respectively with overall average 10.52 years (Megersa, 2016) in West Shoa Zone Oromia region.

Productive Performance of Crossbred Dairy Cows

Lactation length (LL)

Average LL in the study area was reported by the respondents as 7.49 ± 0.13 months (224.7days) as indicated in Table 1. This result was much lower than the previous study report of crossbred dairy cows by Mulugeta and Belayeneh (2013) 333.9 days in North Showa zone, Ethiopia, Asaminew and Eyassu (2009) 10.1 months in smallholder dairy system and dairy cooperatives in Bahir Dar Zuria and Mecha districs in Amhara region, Megersa (2016) crossbred of < 50%, 50- 75% and > 75% was 8.76, 10 and 10.3 months, respectively with overall average 9.69 months in West Shoa Zone Oromia region and Belay *et al*. (2012) 9.13 ± 1.99 months in Jimma town Oromia region. The estimated lactation length was shorter than the standard lactation length of 305 days as defined by (Foley *et al*., 1972). This might be due to the fact that farmers given priority for short calving interval rather than lengthen lactation length; as a result calves wean from their dam from suckling within in short period of time. According to statement of Ball PJH and Peters AR (2004) suckling is a common practice in extensive management systems that interferes within ovarian function, thereby prolonging dry period.

Lactation milk yield (LMY)

Lactation milk yield (LMY) was reported by the respondents as 1481.5 ± 9.94 liters in SSDF and 1978 ± 13.48 liters in MSDF producers, with overall average of 1685.95 ± 8.50 liters as indicated in Table 1. There was significant difference ($p < 0.01$) between small and medium scale dairy farm in the amount of milk produced. The present result was higher than the previous study report of crossbred dairy cows Zelalem (1999) 1508 liters in smallholder milk production system in Central Highlands of Ethiopia, Mulugeta and Belayeneh (2013) 1511.5 liters in North Showa zone of Amhara region. But, it was less than the report of Million and Tadelle (2003) 2055 liters in crossbred dairy cows of (½ Friesian x ½ Baraca) in Ethiopia, Belay *et al*. (2012) 2333.63 liters in Jimma town Oromia, Niraj *et al*. (2017) 2503.6 ± 76.8 litres in and Around Debre Zeit, Ethiopia and Gabriel *et al*. (1983) 2352 liters in crossbred of (½ Friesian X ½ Zebu) in Arsi Oromia, region.

Daily milk yield during early, mid and late stages of lactation

The overall mean milk yield per day per cow during early, mid and late stage of lactation was reported by the respondents as 9.74 ± 0.42 litres, 7.39 ± 0.32 litres and 5.078 ± 0.25 liters per cow, respectively and the overall mean milk yield was 7.40 ± 0.38 liters per cow. There was a significant difference in amount of milk produced ($p < 0.05$) between SSDF and MSDF and within stage of lactation showed significant difference ($p < 0.001$) among early, mid and late stage of lactation in both production scale, except mid stage of lactation with late stage of lactation in SSDF it have significant difference at ($p < 0.01$).

The result was greater than Addis et al. (2015) as they reported that, 7.012 ± 2.73, 5.55 ± 2.83 and 3.50 ± 1.64 liters for 1st, 2nd and 3rd stages of lactation, respectively with overall average yield 5.35 ± 1.23 liters per day per cow and Melku (2016) for crossbred of 25% of HF was 5.76 ± 1.67, 4.84 ± 1.49 and 2.86 ± 1.35 litres in 1st, 2nd and 3rd stages of lactation, respectively with overall mean yield 4.49 ± 1.50 litres in West Gojam Zone Amhara region. But, it was lower than the recent study report by Dessalegn et al. (2016) 14.5 ± 3, 10.6 ± 2.67 and 7.1 ± 2.0 liters in 1st, 2nd and 3rd stages of lactation, respectively with overall average yield 10.8 ± 2.4 liters per day/cow in Akaki, Megersa (2016) for crossbred of <50%, 50 – 75% and > 75% reported that, 7.51, 15.74

and 18.57 liters, respectively with overall average for all crossbred cows was 13.94 liters in West Shoa Zone Oromia and Melku (2016) for crossbred of 75% was 11.37 ± 2.74, 9.22 ± 2.34 and 5.74 ± 1.40 litres in 1st, 2nd and 3rd stages of lactation, respectively with overall mean yield 8.78 ± 2.16 litres in West Gojam Zone Amhara region.

However, this result was slightly comparable with Melku (2016) for crossbred of 50% was 9.86 ± 3.71, 7.57 ± 3.57 and 4.59 ± 1.68 liters in 1st, 2nd and 3rd stages of lactation, respectively with overall mean milk yield 7.34 ± 2.99 liters in West Gojam Zone Amhara region. Production traits are influenced by general management (housing, feeding, health care and breed), availability of quality and quantity of fodder throughout year and environmental conditions which could be the most probable reason for the variation in production level reported in different studies.

Table 1: Reproductive and productive performance of dairy cow in the study area

Variable	SSDF (N=60)	MSDF (N=42)	Overall	P - value
	Mean ± SE			
AFS (months)	17.2 ±0.49	15.46 ± 0.46	16.46 ± 0.35	0.01
AFC (months)	26.2 ± 0.50	24.38 ± 0.46	25.43 ± 0.36	0.14 (ns)
DO (days)	85.0 ± 0.40	76.78 ± 0.29	81.62 ± 0.26	0.121 (ns)
CI (months)	13.208 ± 0.28	12.57 ± 1.27	12.95 ± 0.20	0.119 (ns)
NSC	1.82 ± 0.06	1.79 ± 0.05	1.81 ± 0.04	0.734 (ns)
LL (months)	7.46 ± 0.19	7.535 ± 0.16	7.49 ± 0.13	0.773 (ns)
LMY (liters)	1481.5 ±9.94	1978 ± 13.48	1685.95±8.50	0.01

Note: AFS = Age at first service, AFC=Age at first calving, DO=Days open, CI= Calving interval, NSC= Number of service per conception, LL= lactation length, LMY = lactation milk yield, ns = non significant, SSDF =Small scale dairy farm, MSDF=Medium scale dairy farm, SE=standard error and N = Sample size.

Dairy Farming Constraint

The most important constraints encountered by the producer in the study area were: shortage of feed resources, followed by disease problem, poor market access, shortage of exotic breeds and shortage of water as indicated in Table 2. The present study was comparable with the findings of Gelila (2017) shortage of animal feeds, limited space and animal disease incidence in Hawassa city, Niraj *et al.* (2014) feed shortage and its high costs, disease occurrence, seasonality demand of milk, low price of milk, lack of credit facility in Mekele and Zelalem *et al.* (2011) inadequate animal feed resources as one of the important challenges of Ethiopian dairy sector.

Table 2: Dairy farming constraints

constraints	SSDF (N= 60)						MSDF (N= 42)					
	R1	R2	R3	R4	R5	Index	R1	R2	R3	R4	R5	Index
Feed	46	10	1	2	00	0.397	29	5	3	1	00	0.238
Water	2	13	4	2	11	0.127	00	7	8	00	9	0.114
Disease	2	21	17	6	4	0.231	00	12	11	9	2	0.224
Low HF BL	4	2	10	4	00	0.094	3	5	5	7	2	0.123
Market	5	11	10	3	00	0.150	10	8	7	4	2	0.211

Note: R =Rank, SSDF =Small scale dairy farm, HF =Holstein Frisian, BL =blood level, MSDF=Medium scale dairy farm and N = Sample size.

Animal Health Service

In the study area there is a variation in occurrence of diseases between SSDF and MSDF producers. This might be due to intensification, herd size and level of exotic blood level as indicated in (Table 3) below. The common infectious diseases are mastitis, pastuerolosis, and contagious bovine pleuropneumonia, foot and mouth disease, reproductive disorder, internal and external parasites. The current result was comparable with disease of intensification (mastitis, reproductive disorders) (Melku, 2016).

Table *3.* Disease occurrence in the study area

Type of disease	SSDF (N= 60)		MSDF (N = 42)		Overall
	Freq	Percent (%)	Freq	Percent (%)	Percent (%)
Mastitis	16	26.7	20	47.6	37.15
Pastuerolosis	6	10	3	7.1	8.55
CBP	2	3.3	0	0	1.65
Internal parasite	1	1.7	4	9.6	5.65
Foot and mouth disease	1	1.7	1	2.4	2.05
External parasite	0	0	2	4.8	2.4
Reproductive disorder	0	0	2	4.8	2.4
Total	26	43.4	32	76.3	59.85

Note: Freq= frequency, SSDF =Small scale dairy farm, MSDF=Medium scale dairy farm and N = Sample size.

CONCLUSIONS

The present study shows relatively better management practice in medium scale than small scale dairy farms. Due to this fact it is observed improved performance of dairy cows both in both reproductive and productive traits considered for this study in medium scale than small scale dairy farms. The most important constraints encountered by the producers was: shortage of feed specially in wet season (high cost, lack of accesses), followed by disease (common diseases including; mastitis, pastuerolosis, contagious bovine pleuropneumonia, foot and mouth disease, reproductive disorder, internal and external parasites), poor market linkage, weak AI service (shortage of liquid nitrogen and semen, unwillingness of AI technician to give the service) and shortage of water. Therefore, additional production strategies are required to minimize the adverse effect of constraints and so as to improve the dairy cow productivity in their production environment.

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