2017 Scienceline Publication

Online Journal of Animal and Feed Research

Volume 7, Issue 6: 154-160; Nov 25, 2017 ISSN 2228-7701

A REVIEW ON MILK PRODUCTION AND REPRODUCTIVE PERFORMANCE OF DAIRY CATTLE IN ETHIOPIA

Mohammed ENDRIS[1]

Afar Pastoral and Agro-Pastoral Research Institute, P.O. Box 16, Samara, Ethiopia,

Email: mohaend@gmail.com

ABSTRACT: This review was conducted to review the information on milk production (lactation milk yield, lactation length and milk composition) and reproductive performance (age at first calving, calving interval and number of service per conception) of dairy cattle in Ethiopia. The mean values of lactation milk yield (LMY) ranges between 494 to 809 kg with lactation length (LL) of 128 to 353 days for indigenous breeds, 2343 to 1583 kg with lactation length of 275 to 448 days for crossbreed cows, and 1583 to 3796 kg with lactation length (LL) of 276 to 362 days for exotic breeds respectively. Both LMY and LL were significantly affected by breed, parity and year of calving. In general, F_1 crosses produce more milk compared to F_2 crosses and indigenous breeds. Milk from Boran cows had high percentage of milk fat, protein and total solids than Frisian cross breed cows. However, milk from Friesian crossbreed dairy cows had high content of milk lactose than Boran cows. Mean values of AFC for indigenous breed's ranges between 30.3 to 50.0 months while Calving interval (CL) ranges between 11.8 to 15.6 months respectively. The mean values of AFC range from 29.1 to 55.4 months for Holstein Friesian crosses and 38.8 to 46.9 months for Jersey crosses. The second filial generation (F_2) had longer AFC and CI than those from first filial generation (F_1) crosses. From this review it can be concluded that crossing local cattle with exotic breeds improved milk production but long calving intervals were observed as exotic blood increase.

REVIEW ARTICLE
pii: S222877011700023-7
Received 28 Sep. 2017
Accepted 20 Nov. 2017

Keywords: Crossbred, Milk production, Reproductive, Ethiopia

INTRODUCTION

Ethiopian livestock population estimated to be about 44.3 million cattle (CSA, 2004) where over 60% of the cattle are found in the highlands. Livestock contributes to the production of food (milk, meat and eggs), industrial raw materials (wool, hair, hides and skins), inputs for crop production (draft power and manure) and export earnings (live animals, skins and hides). They also generate cash income which can be used to purchase food grains, seeds, fertilizer and farm implements and for financing miscellaneous social obligations of the smallholder farmers. Dairy research and development programs have been undertaken in the past two to three decades by various organizations. A review of these programs (Sintayehu et al., 2008) that they made minimal impact on the dairy industry. Despite huge livestock population, the high domestic demand for dairy products and favorable climatic conditions in most parts of the country. The per capita milk consumption of Ethiopia is 19 kg/head/year (Belay et al., 2012). This is very low when compared to African (27 kg/head/year) and world (100 kg/head/year) per capita averages (Sintayehu et al., 2008).

This clearly shows a wide gap seen between the current supply and demand for milk in the country. Over 99% of the cattle population in Ethiopia are indigenous and about 42% are milk cows (Demeke et al., 2004).There are over six distinguishable, indigenous cattle breeds (Boran, Horro, Arsi, Fogera,Karayu and Barka) in Ethiopia evolved mainly as a result of natural selection influenced by factors like climate, altitude and available feed supply, endemic diseases, functional objective of livestock owners, management technique and market demands that make them adapted to harsh environmental conditions (IBC, 2004). Most of them belong to the zebu- type with the inclusion of some intermediate short horn sanga type (Rege et al., 2006). The objective of this paper is to review current development on milk production and reproductive performance of dairy cattle in Ethiopia.

To cite this paper: Endris M (2017). A review on milk production and reproductive performance of dairy cattle in Ethiopia. *Online J. Anim. Feed Res.*, 7(6): 154-160.
Scienceline/Journal homepages: www.science-line.com; www.ojafr.ir

Dairy production systems in Ethiopia

The Ethiopian dairy production system is based on predominantly indigenous zebu cattle, which is well adapted to and distributed among the diverse ecological conditions and management systems of the country. Although no exhaustive identification and characterization work has been conducted, it is suggested that there are over 25 types/breeds of indigenous cattle, the most popular ones including Boran, Horro, Fogera, Arsi, Karayu and Nuer (IBC, 2004). The existing dairy cattle production system belongs to any of the following four major livestock production systems: lowland pastoralist dairy production system, rural and highland smallholder dairy production system, urban and peri-urban small scale dairy production system and commercial dairy farms.

i) Lowland pastoralist dairy production system:

About 30% of the livestock populations in Ethiopia are found in the pastoral areas. These areas comprise 50% of the total land area of the country and have altitudes below 1,500 meter above sea level. Livestock doesn't provide inputs for crop production but are backbone of their owners providing all of the consumable and saleable out puts and regarded as insurance against adversity. Milk production is dependent on season due to the rainfall pattern that influences feed availability.

ii) Highland small- holder dairy production system

There are two types of systems in the highland. The traditional system that is based on indigenous breeds and the market oriented system that is based on crossbred dairy cattle. The milk produced is mainly consumed by the household in the traditional system while most of the milk is sold to generate income in the market oriented system.

iii) Urban and peri-urban small scale dairy farming

This system is developed in and around major cities and towns. The main feed resources are agro industrial by products and purchased roughages. The system comprises small and medium sized dairy farms that own crossbred dairy cows. Farmers use all or part of their land for forage production (Azage et al., 2000).

iv) Commercial dairy farms

Commercial dairy farms are located in urban and peri-urban areas mainly in and around the major cities. These farms are specialized dairy farms that own either crossbred and/or pure exotic breeds of dairy cattle. The commercial farms are small- to large-scale dairy farms, the large-scale farms being concentrated in and around Addis Ababa. Based on the type and quantity of inputs, and on the objective and level of intensity of production, the major livestock production systems presented above could be further classified as low-, medium-, and high-input production systems. More than 95% of the livestock population in Ethiopia is kept in low-input systems, in which production is fully dependent on natural resources and the demand for inputs is limited. Most cattle raised in the low-input systems are indigenous breeds (IBC, 2004).

Milk production performance

Milk is the ultimate goal for all dairy producers. Exotic cattle and their crosses are being increasingly used to raise milk production in hot climate. It has been realized that high level of performance could also be obtained from pure breed European cattle in most tropical environment subject to very good management. Indigenous breed of cows are generally considered low milk producers (Tadesse and Dessie, 2003). However, they are the major source of milk in Ethiopia that account for 97 % of the total milk production in the country. Milk yield has remained extremely low with national average of 1.09 liter/day/cow (Belay et al., 2012). The average milk yield of Arsi cows (Lemma et al., 2005) was 1.0 liter/head/day and Fogera cows 506.78 liters per lactation, respectively. This is mainly due to shortage of feed and poor management conditions. Milk production is further affected by the relatively short lactation length and extended post-partum anoestrus resulting in low production efficiencies (Bekele et al., 2011). The indigenous (or traditional) mixed farming and pastoral/agro pastoral systems rely mainly on local breeds, which produce 400-680 kg of milk per cow per lactation period of less than seven months (Million et al; 2004) crossbreeding of the indigenous breeds with imported temperate exotic breeds has been practice to improve the milk productivity of the local breeds through the exploitation of high genetic potential for milk production of exotic breeds and the adaptability to the local environment of indigenous breeds (EARO, 2001). The lactation milk yield (LMY) for indigenous breed's ranges from 494 to 809 kg and LL ranges from 128 to 353 days (Demeke et al., 2002; Tadesse and Dessie, 2003; Haile et al., 2008; Gizaw et al., 2011; Niraj et al., 2014) (Table 1). On the other hand, the lactation milk yield (LMY) and lactation length (LL) for the crossbreeds ranges from 970 to 2343 kg and 257 to 448 days (Tadesse and Dessie, 2003; Kefena et al., 2006) (Table 1). In addition, the lactation milk yield (LMY) for pure Exotic breeds ranges from 1583 to 3796 kg and lactation length (LL) ranges from 276 to 362 days (EARO, 2001; Demeke et al., 2002; Tadesse and Dessie, 2003; Million et al., 2004; Kefena et al., 2006; Bekele et al., 2011) (Table 1).

The review indicates that indigenous breeds had lower lactation milk yield and shorter lactation length than the crossbred and exotic breeds and also Friesian crosses appeared to perform better in both milk yield and lactation length than the Jersey crosses (Table 1). Tadesse and Dessie (2003) reported that breed, parity and year of calving significantly affect lactation milk yield and lactation length. According to Bekele et al. (2011) milk production also increases with parity status but up to the third lactation. The same results on the effect of parity status on lactation milk yield of Barka breeds (indigenous breeds) kept on station had been reported by Haile et al. (2008). The effect of year of calving had been attributed to the change in management and feeding conditions during the years. Lactation milk yield was highest for pure exotic breed however, among crossbred the ¾ F x ½ (Boran, Arsi and Barka) produced the highest yield (Table1). On the other hand, F_1crosses have better lactation milk yield (LMY) than the F_2 crosses. Similar reports (Demeke, 2004; Haile et al., 2008) have been reported that the

To cite this paper: Endris M (2017). A review on milk production and reproductive performance of dairy cattle in Ethiopia. *Online J. Anim. Feed Res.*, 7(6): 154-160.
Scienceline/Journal homepages: www.science-line.com; www.ojafr.ir

superiority of F_1 over the rest of genetic groups. The consistently better rank of F_1 crosses could be attributed to maximum heterotic effect than F_2 crosses. Apparently, the lower LMY exhibited by F_2 crosses might be due to reduction in hybrid vigor (Million et al., 2004). Rege et al. (2006) also reported that the low productivity of F_2 is break down of epistatic effects in the parental population. Furthermore the decline in performance from F_1 to F_2 or backcross generation in tropical environments could be due to recombination losses than other factors.

Table 1 - Mean values of lactation milk yield (LMY) and lactation length (LL) for indigenous, crossbred and exotic dairy cattle in Ethiopia

Genetic groups	LMY (kg)	LL (days)	Location	Source
Indigenous				
Fogera	613	353	On station	Haile et al. (2008)
Barka	552	128	On station	Tadesse and Dessie (2003)
Arsi	809	272	On station	Niraj et al. (2014)
Horro	559	285	On station	Gizaw et al.(2011)
Boran	494	155	On station	Demeke et al. (2002)
Boran	771	198	On station	Demeke et al. (2002)
Barka	672	279	On station	Tadesse and Dessie (2003)
Crossbreeds				
F_1 (½ F x ½ Boran)	2149	359	On station	Kefena et al. (2006)
¾ F ¼ Boran	2336	436	On station	Tadesse and Dessie (2003)
¾ F x ¼ Boran	2343	392	On station	Kefena et al. (2006)
F_2 (½ F x ½ Boran)	1766	360	On station	Kefena et al. (2006)
F_2 (½ F x ½ Boran)	1947	348	On station	Bekele et al. (2011)
F_1 (½ F x ½ Boran)	2278	374	On station	Demeke et al. (2002)
F_1 (½ F x ½ Boran)	2088	328	On station	Tadesse and Dessie (2003)
F_1 (½ F x ½ Arsi)	2247	389	On station	Million et al. (2004)
F_2 (½ F x ½ Arsi)	1723	430	On station	Million et al. (2004)
F_1 (½ F x ½ Arsi)	1977	356	On station	Million et al. (2004)
¾ F x ¼ Arsi	2497	322	On station	Million et al. (2004)
F_1 (½ F x ½ Barka)	2312	326	On station	Tadesse and Dessie (2003)
F_1 (½ F x ½ Barka)	1488	301	On farm	Bekele et al. (2011)
¾ F x ¼ Barka	2373	448	On station	Tadesse and Dessie (2003)
F_1 (½ J x ½ Barka)	970	257	On farm	Bekele et al. (2011)
F_1 (½ J x ½ Boran)	2150	371	On station	Kefena et al. (2006)
F_2 (½ J x ½ Boran)	1343	332	On station	Kefena et al. (2006)
¾ J x ¼ Boran	1767	349	On station	Kefena et al. (2006)
F_1 (½ J x ½ Arsi)	1741	334	On station	Niraj et al. (2014)

F = Friesian, J = Jersey, LMY= Lactation milk Yield, LL = Lactation length

Milk composition

Milk compositions vary between Boran and Boran- Friesian crosses. Percentfat in milk, protein, lactose and total solids in Boran-Friesian crossbred cows ranges from 3.80 to 15.32% and in Borana cows ranges from 4.00 to 16.02 % (Mesfin and Getachew, 2007; Table 2) respectively. Percent of fat in milk (6.01%), protein (4.05%) and total solids (16.02%) contents for Boran cows were higher than that of Friesian crossbred cows whereas Boran-Friesian crossbred dairy cows have higher content of milk lactose (4.18%) than Boran cows (Mesfin and Getachew, 2007; Table 1). **Gonthier** et al. (2005) reported that the type of breed affects milk composition. According to Mesfin and Getachew (2007) indicated that the difference in milk composition between the two breeds (Borana and crossbred dairy cows) may be due to the influences of breed differences in feed conversion efficiency to specific feed type.

To cite this paper: Endris M (2017). A review on milk production and reproductive performance of dairy cattle in Ethiopia. *Online J. Anim. Feed Res.*, 7(6): 154-160.
Scienceline/Journal homepages: www.science-line.com; www.ojafr.ir

Table 2 - Least squares means and standard errors of milk fat, protein, lactose and total solids of Boran and Boran-Friesian crossbred dairy cows

Milk composition (%)	Least Squares Means		
	Boran-Friesian crosses	Boran cows	P value
Fat	5.48 ± 0.02a	6.01 ± 0.05b	P<0.01
Protein	3.80 ± 0.03a	4.05 ± 0.05 b	P<0.01
Lactose	4.18 ± 0.05a	4.00 ± 0.05b	P<0.01
Total solids	15.32 ± 0.03a	16.02 ± 0.05b	P<0.01

[ab] Least square means with different superscripts within row differ at P<0.01 Source: Mesfin and Getachew (2007).

Reproductive performance

Reproductive performance is one of the major factors that affect productivity and profitability of a dairy herd. The production of milk and reproductive stock is not possible unless the cow reproduces. Genetic improvement of all traits of economic importance is closely related to reproduction rate (Gizaw et al., 2011). 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 (Belay et al., 2012). This causes delay in age at first calving and long calving interval.

Research have been conducted to evaluate and improve reproductive performance of indigenous and crossbred cows under a relatively controlled condition at research centers, government owned farms and in some urban and peri-urban dairy areas in the central highland of Ethiopia (Tadesse and Dessie, 2003; Million et al., 2004). However, similar works have been conducted in urban and rural small holder dairy producers (Yifta et al., 2009) and hot low land part of Ethiopia under different production systems (Mureda and Mekuriaw, 2007). In many cases reproductive efficiency of cattle has been measured mainly by considering parameters such as age at puberty, age at first calving, day's open, calving interval and number of services per conception (Azage, 2000; Shiferaw et al., 2003). Reproductive efficiency of dairy cows is influenced by different factors including genetic, season, age, production system, nutrition, management, environment and disease.

Age at first calving (AFC)

This trait is express early in life and directly influences reproductive performance. Early age at first breeding is influences life time production of the cow and reducing generation interval leading to faster genetic gain per generation. Estimates of mean value of AFC obtained for highland zebu was 53 months (Lema et al; 2010). This figure is longer than AFC reported for exotic and indigenous crosses. Similarly another work also revealed that estimates for AFC in Ethiopian cattle were reported to be longer for Zebu (Haile et al; 2008) than for crossbreds (Mureda and Mekuriaw, (2007) analyzed data on reproductive performance of crossbred F_1 (½ F x ½ Zebu) dairy cows and results indicated that AFC was 36.2 months which is longer than AFC of 29.1 months for reported by Haile et al. (2008). Furthermore, in the work done in the central high lands and in Addis Ababa milk shed, the overall means for AFC were found to be 40.6 months (Yoseph et al., 2003) and 29.0 months (Yifta et al., 2009). Different factors contribute to the late age at first calving. Environmental factors especially nutrition determine pre pubertal growth rates, reproductive organ development and onset of puberty.

The mean age at first calving (AFC) of Ethiopian Boran breeds ranges from 45.0 to 46.9 months for those kept on station (Mureda and Mekuriaw, 2007). Moreover, Tadesse et al. (2014) found that age at first calving was significantly affected by year and month of birth in Boran cows. AFC ranges from 39.2 to 42.6 months for Holstein Friesian and 34.0 month for Jersey breed (Negash 2001; Million et al., 2006; Tadesse et al., 2010) respectively. (Tadesse et al;2010) analyzed data on reproductive performance of Holstein Friesian dairy cows in urban and peri-urban dairy production system of Addis Ababa milk shad he found that age at first calving was significantly influenced (p<0.001) by period of birth but not by the effect of herd and season of birth . With good nutrition it is expected that heifers would exhibit fast growth and attain higher weights at relatively younger ages (Tadesse et al., 2010). Mean values of AFC ranges from 29.1 to 55.4 months for Frisian crosses and 38.8 to 46.9 months for Jersey crosses (Million et al., 2006; Mureda and Mekuriaw (2007). Mean values of age at first calving was significantly shortest (29.1 months) for (F_1 (½ F x ½ Zebu) and longest (55.44 months) for (¼ F x ¾ Local) crosses. In addition, F_2 (½ F x ½ Local) and F_2 (½ J x ½ Local) crosses had significantly longer AFC than F_1 (½ F x ½ Zebu) and (F_1 (½ J x ½ Local) crosses (Million et al., 2006. Furthermore the relatively longer age at first calving for F_2 crosses than F_1 crosses can be attributed to unfavorable parental breakdown of epistatic combinations which have been built up in the parental populations (Million et al., 2006).

To cite this paper: Endris M (2017). A review on milk production and reproductive performance of dairy cattle in Ethiopia. *Online J. Anim. Feed Res.*, 7(6): 154-160.
Scienceline/Journal homepages: www.science-line.com; www.ojafr.ir

Calving interval (CI)

Calving interval is the interval between consecutive calving. Calving interval of 12 months is considered ideal assuming average gestation period of 280 days, nearly 85 days would remain for post calving conception to occur. Long calving intervals would indicate prevalence of reproductive problems or poor management of the herd. Estimates of calving interval ranges from 11.8 to 15.6 months in indigenous breeds (Tadesse and Dessie, 2003; Lema et al., 2010; Haile et al., 2008). The mean calving interval was higher for Horro (15.6) and Boran breed (15.5 months) while lowest for Barka breed. Calving interval ranges from 13.8 to 15.8 months in Holstein Friesian (Negash, 2001; Tadesse and Dessie, 2003; Million et al., 2006; Tadesse et al., 2010) and calving interval (CI) for crossbred ranges from 12.2 to 18.5 months (Abdinasir 2000; Tadesse and Dessie, 2003; Million *et al.*, 2006; Belay et al., 2012), respectively.

Arsi cows with Frisian blood level of 25 - 62.5 and more (75%) had similar calving interval of 18.5 months (Abdinasir, 2000) which is by far shorter than 25 months reported for highland zebu (Demeke, 2004) and 26 months for other indigenous breeds traditionally managed in the highlands. Tadesse and Dessie (2003) in their work to study milk productivity of Barka, Friesian and their crosses with Barka and Boran cows found that calving interval was significantly influenced by breed, parity and period of calving. Demeke (2004) attributed this variation to the nutritional conditions that vary seasonally and yearly and to the effect of parity. Calving intervals also tend to be shorter in animals that are more productive in other respects. This may be a reflection of better management and preferential treatment given to more productive animals than unproductive animals (Haile et al., 2008). F_2 crosses had longer calving interval than F_1 crosses (Million et al., 2006). Calving interval (CI) was shorter for Jersey crosses compared to Friesian crosses (Demeke, 2004) indicating the superiority of Jersey crosses over Friesian crosses in terms of adaptation to the local condition.

Number of service per conception (NSPC)

Number of service required for conception (NSPC) is one factor considered in determining reproductive efficiency of cow. It is reflects the efficiency of management. Number of service per conception (NSPC) depends on the breeding system. It is higher under uncontrolled natural breeding than controlled breeding. Haile et al. (2008) reported that values of number of service per conception (NSPC) greater than 2 should be regarded as poor. Number of service per conception (NSPC) for indigenous breeds (Boran, Barka, Arsi and Fogera) ranges from 1.06 to 2.6 (Gebeyhu et al., 2005; Million et al., 2006; Lema et al., 2010; Genzebu et al., 2016). NSPC was lowest for Barka breed (1.11) and higher for Arsi breed (2.4-2.6). Similarly it ranges from 1.50 to 2.16 for Frisian crosses. Azage (2000) reported that the influence of breed and season on NSPC. In agreement with Lema et al. (2010) who reported that NSPC was significantly affected by herd and season that is related to availability of feed, lactation length and milk yield. Moreover, Azage (2000) compared three local Ethiopian breeds (Barca, Horro and Boran) and found that NSPC was lower for animals from wet areas than for those from drier areas. Crossbred cows required fewer services per conception than local zebu cows in both wet and dry areas.

CONCLUSION AND RECOMMENDATION

In general, results of literature review showed that indigenous breeds had lower lactation milk yield (LMY) and lactation length (LL) than crossbreed and exotic breeds. Lactation milk yield was highest for pure exotic breed. However, among crossbred the ¼ local x ¾ HF produced the highest yield. The extreme variability in lactation milk yield observed, between and within breeds in this review could be attributed to genetic, change in climatic and management factors. The review results showed that shorter ages at first calving and calving interval of F1 than F2 crosses of both HF and Jersey crosses with local breed indicating the superiority of F_1 over other crosses. F_1 crosses had shorter AFC and CI compared to other breeds. From this review it can be concluded that crossing local cattle with exotic breeds improved milk production but long calving intervals were observed as exotic blood increased. It is suggested that the strategic improvement of feeding, breeding, management and follow up is important to boost up the reproductive and productive performance as well as genetic maintenance of the breed and sustainable extension service to improve animal feed resources management and Animal health care also deserve due attention.

Auhor's contribution

Mohammed E performed the data collection, reviewed information and write up of the manuscript. The Authors read and approved the final manuscript.

Competing interests

The authors declare that no conflict of interest with respect to the research, authorship or publications of this article.

To cite this paper: Endris M (2017). A review on milk production and reproductive performance of dairy cattle in Ethiopia. *Online J. Anim. Feed Res.*, 7(6): 154-160.
Scienceline/Journal homepages: www.science-line.com; www.ojafr.ir

REFERENCES

Abdinasir IB (2000). Smallholder dairy production and dairy technology adoption In the mixed farming system in Arsi highland, Ethiopia. PhD thesis.Humboldt University of Berlin, Department of Animal Breeding in the Tropics and Subtropics. Germany.

Azage T, Million T, Alemu Y, Yosef M (2000). Market oriented urban and Peri-urban dairy systems. Urban Agricultural Magazine (The Netherlands). pp. 23-24.

Bekele T, Yilma Z, G/Wold A, Demisse S (2011). Milk yield performance of two and three breed crosses of dairy cattle in the central highlands of Ethiopia. JAD. 2 (1): 2011.

Belay D, Yisehak K, Janssens GPJ (2012). Productive and reproductive performance of Zebu X Holstein-Friesian crossbred dairy cows in Jimma town, Oromia, Ethiopia. *Global Vet*., **8** (1): 67-72.

CSA (Central Statistics Authority). 2004. The 2001/2002 Ethiopian AgriculturaSample Enumeration (EASE), Executive Summary, May 2004, Addis Ababa, Ethiopia.

Demeke S, Neser FWC, Schoeman SJ (2004). Estimates of genetic parameters for Boran,

Demeke S, Neser FWC, Schoeman SJ, Erasmes GJ, BVanwyk J, wolde GA (2002). Crossbreeding Holstein Friesian with Ethiopian Boran cattle in tropical highland environment: preliminary estimates of additive and hetrotic effects on milk production traits. J. Anim. Sci , 30 (supplement 4). 30. pp

EARO (Ethiopian Agricultural Research Organization) (2001). Back ground paper on developing animal breeding policy. A working paper. January, 2001. Pp. 21

Ethiopia: reproduction traits. Journal of Animal Breeding and Genetics. 121: 57-65.

Friesian and crosses of Friesian and Jersey with the Boran cattle in the tropical highlands of

Gebeyehu G, Asmare A, Asseged B (2005). Reproductive performances of Fogera cattle and their Friesian crosses in Andassa ranch, Northwestern Ethiopia. Livestock Research for Rural Development.Volume 17, Article #131. RetrievedJanuary 15, 2010, from http://www .lrrd.org/ lrrd17/12/ gosh17131.html.

Genzebu D, Tamir B, Berhane G (2016). Study of Reproductive and Production Performance of Cross Breed Dairy Cattle under Smallholders Management System in Bishoftu and Akaki Towns. Int. J. Adv.Res. Biol. Sci. 3(2): pp 151-157.

Gizaw K, Mulugeta K, Tesfaye M, Sisay E (2011). Comparative reproductive performance of Horro (Zebu) with Horro x Friesian and Horro x Jersey females in sub humid environments of Bako. Livestock research and rural development. 23(8). Available at http://www.lrrd.org/lrrd23/8/Kebe23171.htm.

Gonthier C, Mustafa AF, Ouellet DR, Chouinard Y, Berthiaume R, Petit HV (2005). Feeding Micronized and Extruded Flaxseed to Dairy Cows. Effects on Blood Parameters and Milk Fatty Acid Composition. American dairy Science Association. J. Dairy Sci. Volume 88: 748-756 http://jds.fass.org/cgi/ reprint /88/2/748.

Haile A, Joshi BK, Ayalew W, Tegegne A, Singh A, Yilma Z (2008). Genetic evaluation of Ethiopian Boran cattle and their crosses with Holstein Friesian for milk constituent traits in central Ethiopia. Journal of Cell and Animal Biology Vol. 2 (10): 171-176, October, 2008 Available online at http://www.academicjournals.org/JCAB ISSN 1996-0867 © 2008 Academic Journals

IBC (Institute of Biodiversity Conservation). 2004. The state of Ethiopia's Farm Animal Genetic Resources: A contribution to the first report on the state of the world's animal genetic resources. May 2004, Addis Ababa, Ethiopia.

Kefena E,. Hegde BP, Tesfaye K (2006). Life time production and reproduction performance of *Bostaurus x Bosindicus* crossbred cows in the Central highland of Ethiopia. Eth. J. Anim. Prod. 6 (2): 37-52.

Lemma H, Belihu K, Sheferaw D (2010). Study on the reproductive performance of Jersey cows at Wolaita Sodo dairy farm, Southern Ethiopia Wolaita Sodo University, 14 (1): 53-70.

Mesfin R, Getachew A (2007). Evaluation of grazing regimes on milk composition of Boran and Boran-Friesian crossbred dairy cattle at Holeta Research Center, Ethiopia. *Livestock Research for Rural Development.Volume 19, Article #179* Retrieved August 26, 2010,fromhttp://www.lrrd. org/ lrrd19 /12/ mesf 19179.htm

Million T, Tadelle D, Egbert K (2004). Genetic and Non genetic effects on production and reproduction parameters of Arsi cattle and their Holstein Friesian crosses in Ethiopia. Eth. J. Anim. Prod. 4 (1): 70-79.

Million T, Tadelle D, Tessema G, Tamirat D, Gojam Y (2006). Study on age at first calving, calving interval and Breeding efficiency of Bos-taurus, Bosindicus and their crosses in the highland of Ethiopia. Eth. J. Anim. Prod. 6 (2): 1-16.

Mureda E and Mekuriaw Z (2007). Reproductive Performance of Crossbred Dairy Cows in Eastern lowlands of Ethiopia. Livestock Research for Rural Development.Volume 19, Article #161 Retrived, Augast 30, 2010 from *http://www. lrrd.org /lrrd19 /11/ mure 19161.htm*

Negash M (2001). Genetic studies of fertility performance in Holstein Friesian. Indian. J. Anim. Sci., 71 (1): 45-47.

Niraj K, Alemayehu E, Abreha T, Hailelul AY (2014). Productive performance of indigenous and Holstein-Friesian crossbred dairy cows in Gondar, Ethiopia. Vet. World, 7(3): 177-181.

Rege, JEO, Ayalew W, Getahun E, Hanotte O, Dessie T (2006). DAGRIS (Domestic Animal Genetic Resources Information System). International Livestock Research Institute, Addis Ababa, Ethiopia. http://dagris.ilri.cgiar.org

Shiferaw Y, Tenhagn BA, Bekana M, Kassa T (2003). Reproductive performance of crossbred Dairy cows in different production systems in the central Highlands of Ethiopia. Trop. Anim.Health and Produ.25: 551-561.

Tadesse M, Dessie T (2003). Milk production performance of Zebu, HF and their Crosses in Ethiopia. Livestock Research for Rural Development. 15(3): 1-11.

Tadesse M, Thiengtham J, Pinyopummin A, Prasanpanich S (2010). Productive and reproductive performance of Holstein Friesian dairy cows in Ethiopia. Livestock Research for Rural Development. Volume 22, Article #34. Retrieved January 15, 2010, from http://www.lrrd.org/lrrd22/2/tade22034.htm

Tadesse S , Fesaha G, Abebe A, Hailu B, Dejen W (2014). Department of Animal Science, Debre Tabor University Assessment of Productive and Reproductive Performances ofCross Breed Dairycows in Debre tabor town. Vol. 4 No 23.

To cite this paper: Endris M (2017). A review on milk production and reproductive performance of dairy cattle in Ethiopia. *Online J. Anim. Feed Res.*, 7(6): 154-160.
Scienceline/Journal homepages: www.science-line.com; www.ojafr.ir