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REVIEW ON PRODUCTIVE AND REPRODUCTIVE PERFORMANCE OF INDIGENOUS DAIRY CATTLE BREEDS UNDER FARMER'S MANAGEMENT PRACTICES IN ETHIOPIA

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REVIEW
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ABSTRACT: **The aim of the review is to summarize the Productive and reproductive performance of different indigenous dairy cattle breeds under farmer's management practices. Ethiopia is the home of large numbers of livestock due to having varied and extensive agro-ecological zones. From the total annual milk produced cattle milk, is the most prominent compared to other livestock species in Ethiopia. Numerous finding showed that calving interval, daily milk yield, lactation length and age at first calving are one of the major measures of productive and reproductive performance parameters for dairy cattle production. Different report indicated that productive and reproductive performances of cattle are very poor due to varied factors; the causes for low performances of dairy cattle were genetic and environmental factors like feeding, housing and health care. In Ethiopia most of (98.20%) cattle breeds are local breeds the remaining (1.8%) are hybrid and exotic breeds. Then, the genetic performances of these breeds are poor, even though they have good adaptation in harsh environmental conditions. So, training and awareness creation should be given particularly to the farmers on major management practices like feeding, housing and health care and genetic improvement strategies should planned and practiced.**

Keywords: **Dairy, Ethiopia, Productive performance, Management, Reproductive performance**

INTRODUCTION

Ethiopia is believed to have the largest livestock population in Africa (CSA, 2017). The varied and extensive agro-ecological zones and the importance of livestock in livelihood strategies make Ethiopia home to large numbers of livestock. Indeed, Ethiopia has the largest livestock inventory in Africa, 59,486,667 cattle (CSA, 2017). Out of this total cattle population, the female cattle constitute about 55.5 percent and the remaining 44.5 percent are male cattle. Eighty-three percent of all milk produced in Ethiopia comes from cattle with the remainder coming from goats and camels (MoARD, 2007). Which is lower than the report of CSA (2011) and CSA (2017) cows contribute to about 95% and 94.6 % of the total annual milk produced compared to other livestock species, respectively.

Despite the largest cattle population in Ethiopia productive and reproductive performances are very poor (Yosefe et al., 2003; Belay et al., 2012 and Melku et al., 2016). Similarly, Niraj et al. (2014b) and Nibret et al. (2014) reported that reproductive performance of dairy cows was found to be less than the optimum values desirable for profitable milk production in different parts of Ethiopia. According to Belay et al., (2012) the cause for low performances of dairy cattle might be genetic and environmental factors like feed shortage, low level of management, lack of access to land, disease, lack of proper poor breeding management such as lack of accurate heat detection and timely insemination might have contributed considerably to long days open (postpartum anestrous), late age at first calving, long calving interval, short lactation length and low milk production. This is in line with ILCA, 1990; Perera, 1999 and Zegeye, 2003 revealed that productive and reproductive performance of dairy cattle is influenced by genetics, disease feed and other management practices.

Productive and reproductive traits are crucial factors determining the profitability of dairy production (Fikire Lobago et al., 2007). Similarly, production and reproductive performance traits are mattered for being successful or bankruptcy of dairy farm enterprises as these traits are major importance in dairy production (Saeed et al., 1987). Which is similar with the report of Cavestany et al., 2001 and Pursley et al., 1997 that showed calving interval, daily milk yield, lactation length and age at first calving are one of the major numerous measures of production and reproductive performance parameters for dairy cattle production. However, there is limited information on regarding to reproductive and productive performance of local cattle in Ethiopia. Therefore, having information on performances productive and reproductive of local cows in Ethiopia would help to suggest the future genetic and non genetic improvement options for the producers to enhance profit.

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Production performance of indigenous dairy cattle

Daily milk yield. According to Zereu and Lijalem, 2016 reported that the average daily milk yield per cow in rural community of Wolaita Zone, Southern Ethiopia was 1.989 ± 0.063 liters. Which was in approximate to the results of studies conducted by Dessalegn (2015), Brokken and Senaite (1992), Mugerwa et al., (1983), Azage et al., (2003), Kebede (2006), CSA (2013) and CSA (2017) from different part of the country who had reported that 2.06 ± 0.5, 2.0, 2.19, 2 ± 0.07, 1.8, 1.32 and 1.37 litres/cow per day, respectively. However, their finding is less than the report of Merha (2006) that indicated the daily average milk yield of Abergele cattle to be 0.75 liters. The value of average daily milk yield obtained from the study of Zereu and Lijalem (2016) was significantly lower than values obtained from Minale and Yilkal (2015) in southern Ethiopia who reported that consecutively 2.4, 3.0, 2.6 for 1st, 2nd, and 3rd lactations in Chencha and 2.07, 2.6, 2.6 for 1st, 2nd, and 3rd lactations in average milk yield per day per cow in liters for local breeds in kucha areas. Generally, the local or indigenous cattle have different milk yield performance under different production systems. The difference in different finding may be attributed to difference in location and management practices.

Dairy production is a critical issue in Ethiopia livestock-based society where livestock and its products are more important sources of food and income, and dairying has not been fully exploited and promoted. The daily milk yield of local breeds has been recorded by Zewdu, (2004) that revealed one Fogera cow gives 1.39 liters minimum and 4.63 liters maximum in a day. In contrary to this the average daily milk yield of exotic cows was 8.78 ±2.76 and 5.83 ±0.57 for the urban and peri-urban areas respectively. In addition to this, the average daily milk yield of local cows was 2.56±1.12 and 1.87±0.79 for the urban and peri-urban areas respectively (Gebrekidan et al., 2012). The milk production levels also vary between different dairy breeds. On average, crossbreed cows produces 8 liters per day per cow and the indigenous one produces 2 liters per day per cow (Zewdu, 2004; Adebabay, 2009). Another study conducted in North Showa zone indicates that 50% crossbreeds (1511.5 L) produce more amount of milk than local breeds (457.89 L) per lactation (Belay et al., 2012). Mulugeta and Belayneh (2013) reported that mean milk production per lactation between Horro and Holstein Friesian was 2333.63 L. This could be either due to complementary or heterosis effect to the achievable environment. A number of production constraints are seriously affecting smallholder dairy production. In addition to already highlighted lack of capital to acquire the crossbreeds, many farmers face difficulties in getting full information on the breeds they are going to buy. Other factor hampering milk production include inadequate feed base, high cost of bought-in feeds, shortage of cash to buy concentrate feeds (Zewdu, 2004; Anteneh, 2006). Milk yield performance of cows as reported by farmers varies across the different dairy production systems in the study area, mainly due to differences in breed and management (Azage et al., 2013).

Reproductive performance of indigenous dairy cattle

The reproductive performance of the breeding female is probably the single most important factor that is a prerequisite for sustainable dairy production system and influencing the productivity. Number of services per conception, days opens till conception and calving interval are important reproductive traits which are crucial for determining the profitability of dairy production (Nibret and Tadele, 2014). The reproductive efficiency of a dairy herd can be measured in several ways, such as by measuring pregnancy rate, percentage of cows calving each year, average calving interval, average number of days dry, and number of live calves born each year. Although each of these measures affects the profitability of the dairy business in a slightly different way, the calving interval affects both the total milk production of the dairy herd and the number of calves born. In most modern dairies, the general practice is to breed cows early, with the aim of establishing a calving interval of 12 to 13 months, which is considered optimum; hence, calving interval is considered an important index of reproductive performance (Roberts, 1986; Arbel et al., 2001).

Lactation length

The lactation performance of dairy cattle is usually measured by determining the total milk yield per lactation or per year, average daily milk yield, lactation length, lactation persistency, and milk composition. Generally, the reproductive performance and lactation performance of dairy cattle are closely associated with each other. Breeding failure has a clear negative influence on milk production and farm income and determines the future sustainability of a dairy farming operation. Milk production level and lactation persistency are crucial factors determining the appropriate calving interval (Arbel et al., 2001). On the other hand, the costs of fertility depend on the stage of lactation and the shape of the lactation curve. Cows normally have a lactation curve that loses 8 to 10% per month after the peak, but those rare animals whose production declines by only 4% or so may make a longer calving interval justified (Esslemont, 2003).

Gestation length, which is more or less constant, varying slightly due to breed, calf sex, litter size, dam age, year, and month of calving and little can be done to significantly manipulate the gestation length (Fikre et al., 2007).

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Lactation length of indigenous cattle increased when crossed exotic blood level. For example, the average lactation length of indigenous Arsi, Zebu and Boran breeds was 203.75 days while the average lactation 9 length of their 50, 75 and 87.5% cross were 262.25, 284.25, and 294.25 days respectively. Similarly, another study conducted in North Showa zone indicated that local breeds (273.9 days) had shorter lactation length than crossbreeds (333.9 days) (Mulugeta and Belayneh, 2013). In most dairy units, a lactation length of 305 days (10 months) is commonly accepted as a standard. However, such a standard lactation length might not work for dairy cows in the urban and peri urban areas of East Africa. Both (Msanga et al., 2000) in Tanga and (Yoseph et al., 2003) in Addis Ababa reported shorter (8.8 to 9.7 months) and longer (11.1 months) lactation lengths in urban and peri urban dairy units respectively. However, Ayenew et al., (2009) had different observations in which dairy cows in urban dairy units had longer (11.2 months) lactation lengths compared to cows kept in peri urban dairy units (7.5 months). Average lactation lengths in months (Mean ±SD) of local, cross and exotic breed were 6.5±1.63, 7.48±1.69, 8.82±1.97 and 7.20±2.50, 7.89±2.05 and 6.60±3.20 urban and peri urban areas, respectively (Gebrekidan et al., 2012). The overall average lactation length in months for crossbred cows in urban and secondary town farms in the Adama milk shed was 10.9 ± 0.1 and 11.0 ± 0.1, respectively(Nigusu and Yoseph, 2014). An extended lactation period has practical implications to the dairy farmer as it provides compensation for the extended calving interval (Fikre et al., 2007). Nevertheless, the profitability of short or extended lactation length depends on lactation persistency.

Calving interval

CI has two components: 1) calving-to-conception interval (CCI) or days open, which is considered to be the most important component determining the length of the calving interval, and 2) gestation length, which is more or less constant, varying slightly due to breed, calf sex, litter size, dam age, year and month of calving, and little can be done to significantly manipulate the gestation length (Mukasa-Mugerwa et al., 1991). The CCI itself is influenced by cow and management/environment-related factors, such as method and efficiency of heat detection, type and efficiency of breeding service and the ability of the cow to resume regular ovarian cyclicity after calving, display an overt heat signs, and conceive with the given service. The gap between two successive calving is called calving interval (Mulugeta and Belayeneh, 2013). The overall mean calving interval of local and crossbreed dairy cows place of work was found to be 23 ± 4.3 months of which for local cows 24.94 ± 4.1 13 months and for crossbred 22 ± 4.4 months, the overall calving interval was prolonged, and on the other hand, crossbreed cows calving interval was shorter and better than local cows (Mulugeta and Belayeneh, 2013) local cow in North Shoa zone. Calving interval is an important factor in measuring the breeding efficiency and directly correlates with the economics of milk production. Reproduction in dairy cows with regular and shorter calving interval (365-420 days) is a key feature for the rapid multiplication of the breeding stocks. However, studies in urban and peri urban areas of East Africa have reported long calving intervals (406 to 562) for dairy cattle. Long calving interval is a common problem in urban and peri urban areas and it is linked to poor body condition score and mineral deficiency especially inorganic phosphorus (Swai et al., 2005b). The long mean calving intervals result into low calf crop and low level of production.

Age at first service

According to Gidey (2001), age at first service (AFS) is the age at which heifers attain body condition and sexual maturity for accepting service for the first time. Age at first service signals the beginning of the heifer's reproduction and production and influences both the productive and reproductive life of the female through its effect on her life time calf crop. Age at first service is influenced by genotype, nutrition and other environmental factors (Zewdie, 2010). This reported an earlier age at puberty for F1 Friesian crosses than for indigenous zebu breeds. Age at first service was reported to be 44.8 months for Fogera breeds (Giday, 2001); In addition, age at first service reported in Ethiopia include about 53 months for highland Zebu (Zewdie wondatir, 2010), 55 months for Horro cattle (Zewdie wondatir, 2010), 53.9 months for Boran cattle inseminated artificially (Ababu, 2002) and 34.4 months for Ogaden cattle (Getinet, 2005). AFS crossbreed cow was reported by (Nibret, 2012) 15.3±0.23 and 15.5±0.24 urban and periurban respectively in Gondar and higher was recorded 24.9±3.8 Asella Towen (Hunduma, 2013).The desirable age at first calving in local breeds is 3 years and 2 years in crossbreed cattle. Prolonged age at first calving will have high production in the first lactation but the life time production will be decreased due to less no of calving. If the age at first calving is below optimum, the calves born are weak, difficulty in calving and less milk production in first lactation (Nerja and Kbrom, 2014).

Age at first calving

It determines the beginning of the cow's productive life and influences her life time productivity (Ojango and Pollott, 2001). The beginning of productive life the heifer is called age at first calving. The overall estimated average age at first calving was found to be 40.9 ± 6.6 months, of which 47.16 ± 8.7months for local cows, and 37.95 ± 9.4 months for crossbreed cows, which was higher than the expected to be achieved (Mulugeta and Belayeneh, 2013).

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Several studies carried out in East African cities revealed AFC to have ranged from 29.7 to 46.0 months. Age at first calving is affected by factors such as breed, nutritional status and management differences of dairy cows. Pure exotic and cross bred cows attain AFC differently. For instance, crossbreed cows in Addis Ababa (Ayenew et al., 2009) had lower (29.7 months) and higher (46.months) AFC, respectively. This indicates that pure exotic heifers reach puberty earlier than cross bred cows. Since the results were reported from different cities then management and feeding differences could be the reasons. Farm size has been indicated to affect AFC in dairy animals. According to (Lemma Abate and Kebede, 2011) small and large dairy farms in Addis Ababa had longer (34.2 months) and shorter (32.6 months) AFC respectively. Another report by Addisu, (1999) indicated that the AFC of Fogera breed was 47.6 ±0.77 months at Metekel Ranch. The AFC of 50% Fogera-Friesian crosses was reported to be 40.46 ±0.93 years (Addisu, 1999). However, farmers strongly emphasized that AFC is highly influenced by the nutritional status.

CONCLUSION AND RECOMMENDATIONS

Generally, productive and reproductive performances of indigenous dairy cows were affected by different factors like genetic, production systems and management practices. From the above conclusion the following recommendation were forwarded:

- Indigenous dairy cattle breeds had the ability of better adaptability of environments; there should be a controlled crossbreeding and selection strategy in line with conservation of the local adaptive traits of the breeds.
- Training and awareness creation should be given particularly to the farmers to increase the reproductive performance of the dairy cattle and livelihood of the dairy farmers through improved management practices.

DECLARATIONS

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Author's contribution
All authors are equally contributing for this review process like data collection, manuscript preparation and editorial works.

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Competing Interests
The authors declare that it has no any competing interests.

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