Status of Production, Reproduction and Management Practices of Dairy Cow in Ethiopia: A Review

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ABSTRACT
In Ethiopia, farmers are practicing animal husbandry under different production systems. However, the production and reproduction performance of dairy cows are very low due to the reasons such, the low genetic capacity of the indigenous cow for milk production, substandard feeding and poor health care. By considering this, the paper is aims to review the status of production, reproduction and management practices of indigenous and crossbred dairy cow. A number of research works have been done since two last decades to evaluate and improve the production and reproduction performance of indigenous and crossbred dairy cow in the country. On this basis, the average milk yield was not being exceeded 2 liters per day for indigenous dairy cow. On the other hand, the average age at first service was ranged between 18.7 and 24 months for crossbred dairy cow. Further, the average age at first calving was being extended to 48.9 and 37.95 months for indigenous and crossbred dairy cow, respectively. Regarding management practices, more farmers are using separate house for their dairy cow and they haven't experience of record keeping in different parts of the country. Moreover, stall feeding was the primary feeding method which has been reported by many authors. Therefore, it should be emphasized to enhance improved management practices by the dairy farmers.

Key words: Dairy cow, Management practices, Performance, Production, Reproduction.

Ethiopia is known by the largest livestock population in Africa (Metaferia et al., 2011). The sector contribute significantly to the national economy and the livelihood of the people especially in the rural area by generating income to the farmers, ensuring food security and contributes to the asset, social, cultural and environmental values and sustain livelihoods of the people (Estefanos et al., 2014). According to the report of CSA (2017), from the total cattle population of the country is estimated to be about 60.39 million; the female cattle constitute about 54.68%, out of this dairy-cows are estimated to be around 6.66 million (11.03%) and 45.32% are male cattle.

Despite the largest population, the production and reproduction performance of dairy cows is very low due to a number of reasons such, the low genetic capacity of the indigenous cattle for milk and meat production, substandard feeding, poor health care and other management practices (Belay et al., 2012; Azage et al., 2013; Mulugeta and Belayneh, 2013 and Hulagersh et al., 2017).

However, productive and reproductive efficiency of crossbred and indigenous dairy cow and their management practice has not been fully studied (Belay et al., 2012; Dejene, 2014; Desselegn et al., 2016 and Ayenesh et al., 2018). Therefore, with the aim of enhance sustainable utilization of milk and milk products, it is very essential to review the current status of production, reproduction and management practices of indigenous and crossbred dairy cow in Ethiopia.

Dairy production system
According to the data reported from Bure by Azage et al. (2013), the total number of crossbred and indigenous cattle was lower in rural than Urban and peri-urban production system, i.e. the proportion of crossbred cattle is very low in rural dairy production system, better in peri-urban and higher in urban dairy production system. Dairy production system could be categorized in three production systems based on management practices, marketing situations, feed source and feeding system, herd type and size, land use type and objective of keeping animal (Gillah et al., 2012 and Asrat et al., 2013).

Urban dairy production system
Urban production system is developed in towns located in the different agro-ecology of Ethiopia and comprises medium to large sized dairy farms, which are capable of keeping improved dairy stock (Mulugeta and Belayneh, 2013). It is seen in cities and/or towns for the production and sale of milk, with little or no land resources, only making use of the human and capital resources made available mainly for specialized dairy production under stall feeding conditions (Azage et al., 2013). The main feed resources are agro-industrial by-products, purchased roughage with the primary...
objective of milk production for generating additional cash income (Aneteneh et al., 2010).

Peri-urban dairy production system
This system comprises of small sized to medium dairy farms which are also capable of keeping improved and local dairy stock (Gebretnsae et al., 2017). The farmers have small size of grazing land; they use semi-grazing systems and also practice under stall feeding conditions for improved animals (Gillah et al., 2012 and Asrat et al., 2013). The main feed resources are agro-industrial by-products, purchased roughage and in addition they use crop residue, pasture land with the primary objective of milk production (Aneteneh et al., 2010). Peri-urban dairy systems are located mainly in rural areas or at the edge of the urban areas having relatively better access to urban centers in which dairy products are highly needed (Azage et al., 2013). These systems contribute enormously towards filling the large demand-supply gap for milk and milk products in urban centers where dairy products consumption is unusually very high and are known to be the leading suppliers of raw milk to the processors of different scales (Zelalem et al., 2011). Dairying practice in urban and peri-urban areas paved way for job opportunities, providing farmers with the opportunities to use labour, land and other feed resources to bring in regular income (Gillah et al., 2012).

Rural dairy production system
According to the report of CSA (2017), green fodder (grazing) is the major type of feed (about 54.59 percent) followed by crops residue that is 31.60 percent, hay and by-products (6.81 and 1.53 percent) of the total feeds, respectively in the rural areas of the country. Most parts of the highlands are used for both crop and livestock production (mixed farming) within subsistence smallholder farming systems (Anteneh et al., 2010; Gillah et al., 2012; Asrat et al., 2013 and Gebretnsae et al., 2017).

Production performance
Production efficiency is the main concern of any cattle producing industry (Azage et al., 2010). Productive performance of Ethiopian cattle depends on different reproduction and production traits (Tadesse et al., 2010). Among productive traits, daily milk yield, lactation milk yield, lactation length, birth weight, weaning weight, lactation length productive life span and slaughter weight are very important traits (Wondosseen and Tesfaye, 2017 and Taju, 2018).

Milk production
Daily milk yield is a very important production efficiency trait, which is a combination of milk yield and lactation length (Habtamu et al., 2010; Gebrekidan et al., 2012). Indigenous dairy cows are generally considered as low milk producers (Kebede et al., 2017). According to the report of Taju (2018) revealed that the overall milk yield of indigenous dairy cows in Dawro zone was 1.8±0.045 liters per day. Similar results were reported for different indigenous dairy cows of the country approximately with the range of 1.7 to 1.9 liters per day (Gebrekidan et al., 2012; Wondosseen and Tesfaye, 2017). In contrary to this result, higher than 2 liters per cow per day was also reported in different part of the country for indigenous Ethiopian cows (Damitie et al., 2016; Kebede et al., 2017). The difference could be due to differences in feed availability particularly supplementation differences and climate impact. The milk yield for indigenous dairy cow is about 1.5 liters per day per cow, which is about one-eighth of the milk yield (9 liters per day per cow) for crossbred dairy cows (Asrat et al., 2013).

Lactation length
Study conducted in North Showa zone indicated that indigenous dairy cows had (273.9 days) shorter lactation length than cross breeds (333.9 days) (Mulugeta and Belayneh 2013). Another report indicated that the overall mean lactation length of indigenous dairy cows was 8.6±0.930 months in Dawro zone(Taju, 2018) which is comparable with previous finding of Belay et al., (2012) and Kumar et al., (2014) who reported mean lactation length of 255.75 and 247.11±22.64 days in Jimma zone and Mekele, respectively for indigenous dairy cows. In contrary to this result, lower lactation length of indigenous cows was reported by CSA (2017) that average lactation period per cow during the reference period at country level about six months. But longer lactation length reported by Mulgeta and Belayneh (2013) who reported lactation length of 9.13±2.63 months for indigenous dairy cows in Wolaita zones Southern region.

Longevity
According to the report of Keffena et al. (2013), the entire lifespan was 11 years for indigenous dairy cows and 7.9 years for crossbred dairy cows in Cheffa farm in Ethiopia. Similarly, Dereje (2015) and Taju (2018), reported that the overall longevity of the indigenous dairy cow is 11.5 and 11.4±0.181 years in the Bakko and Dawro zone indigenous cattle.

Reproduction performance
High reproductive efficiency is necessary for efficient milk production and has an important influence on herd profitability (Demitie et al., 2016). It is expressed by the extent of reduction of reproductive wastage and affects lifetime milk and meat production (Nuraddis et al., 2011). The main indicators that would be considered in reviewing reproductive performance are age at first service, age at first calving, calving interval, days open and number of services per conception (Habtamu et al., 2010; Aynalem et al., 2011 and Demitie et al., 2016).

Age at first service
Age at First Service (AFS) is the age at which heifers attain body condition and sexual maturity for accepting service for the first time (Mulugeta and Belayneh 2013). As some researchers reported that the average age at first service was 18.96 (Tadesse et al., 2010), 24 months (Lemma and Kebede, 2011), 18.7±3.7 and 18.7±3.5 months for cross
breed cattle reared by the farmers in Bishoftu and Akaki, respectively (Desselegn et al., 2016). Moreover, Belay et al., (2012) where report that the AFS for cross breed dairy cows were 24.30±8.01 in Jimma town and 23.2 months in Gonder town (Nuraddis et al., 2011). The irregularities in feed supply and differences in management systems could be contributed to bring about variations in age at first service in different areas.

Age at first calving

According to the Taju (2018), the overall age at first calving (AFC) of indigenous dairy cow was 48.9 ±0.259 months or approximately 4 years in Dawro zone which is in line with Mulgeta and Belayneh (2013), who reported that the mean of AFC of indigenous dairy cow in Chacha area cattle of North Shewa zone with the value of 47.16± 8.7 months. Higher AFC was reported by Kebede et al., (2017) who reported that 4.7 ±1.31, years for Gofa cattle. At the other hand, shorter age at first calving for crossbred than indigenous cow has been reported by (Lemma and Kebede, 2011; Hunduma, 2012 and Mulgeta and Belayneh, 2013), who reported 34.7, 34.8 and 33.2 months, respectively, for crossbred cows in different parts of Ethiopia. The overall estimated average age at first calving was found to be 40.9 ± 6.6 months, of which 47.16 ± 8.7 months for indigenous dairy cows and 37.95±9.4 months for crossbreed cows, which was higher than the expected to be achieved (Taju, 2018).

Calving interval

The calving interval (CI) is a function of a day’s open and gestation length and shorter in crossbred than indigenous cows under proper management of animals, as reported by Yifat et al. (2012). Crossbreds have 622.6 days of calving intervals in Tatesa Cattle Breeding Center and also another result was reported by Mulgeta and Belayneh (2013) and Belay et al., (2012) in North Showa zone and Jimma Zone indicated that crossbreds have calving interval of 660 and 640.8±3.84 days respectively. A recent result was reported by Taju, (2018) for overall average CI of 16.0±0.141 months of indigenous dairy cow, which is longer than the CI reported by Kumar et al., (2014); Desselegn et al. (2016) and Gebratnsae et al. (2017) as 13.8±9, 14.82 and 12.03 months for indigenous dairy cow around Mekele Tigray regional state, crossbred in Bishoftu area and cattle in highland of Bure districts of Oromiya regional state and begaite cattle of Amhara regional state. On the other hand longer CI of 54.1 months (Dejene, 2014) and 18.72±0.5 months (Ayenesh et al., 2018) for Kerrayu and cattle around Gonder area respectively, was reported. The variation could be due to feed shortage, calving season and lack forage availability in both indigenous and crossbred dairy cows reported in different parts of the country.

Open days

Day open (OD) is the part of the calving interval that can be shortened by improved herd management and interval between date of calving and date of conception (Menale et al., 2011). Another study on reproductive performance of indigenous dairy cows at small holder farm conditions in and around Maksegnit town stated that the day open in indigenous dairy cows was 86.5 days (Nibret and Tadele, 2014). According to Tadesse et al., (2010) a herd average of less than 85 open days indicates that cows are being breed early, 85 to 115 days considered as optimum for dairy herd, 116 to 130 days indicate slight problem, 131 to 145 days moderate problems, while more than 145 open days is considered as severe reproductive problem in the dairy herd.

Factors like delayed resumption of ovarian activity after calving, longer interval to first estrus and brief shorter duration of estrus along with its silent symptoms, scarcity and deterioriation of available feeds, might have contributed to difficulty in heat detection and timely insemination of the cows resulting in prolonged OD (Melaku et al., 2011). The variation could be attributed to differences in management practices like lack of giving attention for local animal; feed shortage and lack of proper heat detection might be contributory factors for long day open in local dairy cows reported in this study.

Number of services per conception

Number of services per conception (NSPC) is one of the measurements for reproductive efficiency, expresses the fertility level of cows and depends largely on the breeding system used and it is higher under uncontrolled natural breeding than hand-mating and artificial insemination (Azage et al., 2013; Niraj et al., 2014). Lack of knowledge, in appropriate time of insemination, unqualified technician, hygienic problem and disease are the most common reasons for frequent breeding (Desselegn et al., 2016). According to Kumar et al. (2014), indigenous cows had the significantly higher NSPC (2.2±0.2) than that of HF crossbreds (1.5±0.3) in Gonder under small holder management system. Similarly, Yifat et al., (2012) reported number of service per conception as 1.62 and 1.67 central highlands and mid Rift valley parts of Ethiopia, respectively.

Husbandry System of Indigenous and Crossbred Dairy Cow

Feed and feeding system

According to the report of Kiros (2018), the main feed and feeding system were grazing and stall feeding and stall feeding in urban and peri-urban of Holetta, Bishoftu, Sululta and Assela. Similarly, Desselegn et al. (2016) reported 74.6% and 25.4% of the dairy owners in Bishoftu and Akaki towns use stall feeding and stall feeding with limited grazing feeding systems, respectively.

Housing management of dairy cow

According to Ayalew (2017) reported that in South Wollo Zone, Dessie town of Ethiopia all (100%) of the urban and peri-urban respondents used separate house for their dairy cattle. Similarly, Kiros (2018), reported that almost all dairy owners were used separate housing system for their dairy
cattle in urban and peri-urban of Holetta, Bishoftu, Sululta and Assela. Additionally, in urban and peri-urban dairy farms of Mekelle about 80% in urban and a 3.33% in peri-urban medium and large scale dairy farms, respectively were using separate housing system (Hulagersh et al., 2017). In contrary, Asrat et al. (2013) reported that 60% of dairy producers in urban dairy production system of Boditti town, Wolaita Zone used the same house for family and animals. The differences could be attributed to variations in management systems and financial related issues.

According to the report of Kiros (2018), in many of the study areas, dairy producers were not keeping records. Similarly, in and around Boditti town, South Ethiopia 95% of dairy farmers were not practicing record keeping and the main reason raised for not keeping records was farmer’s lack of awareness on benefits of keeping records (Asrat et al., 2013). The lack of record keeping may have negative impact on productivity, decision making on progress and also may lead to inbreeding between closely related herds (Desalegn, 2011). Milk yield, service and calving dates were the main parameters recorded by dairy producers (Kiros, 2018). Similarly, Asrat et al. (2016) also stated that in and around Wolaita Sodo town 42.7% (Town) and 27.8% (Surroundings) of dairy farmers were found to maintain breeding/AI and reproduction records, respectively.

Health and disease control management

Disease is one of the major problems associated with dairy reproductive or milk productions system and diseases of lactating animals such as, mastitis, ketosis, hypocalcaemia, milk fever, are serious economic problems for dairy farmers (Dawite and Ahmed, 2013 and Hulagersh et al., 2017). According to Hulagersh et al. (2017), results of observational study have shown that external parasitic infestation (87.6%), respiratory problems (48.8%) and diarrhea (50.7%) were the major health problems noticed and majority of the studied farms (76.1%) were having tick infestations, followed by lameness (61.2%), different simple and/or complicated wound problems (23.9%) and mange mite infections (17.9%). Similarly, Dawite and Ahmed, (2013) reported that several reproductive health problems including lameness, sterility, dystocia and brucellosis, in dairy cows kept under different management systems in and around Kombolcha, Northern-Ethiopia.

Breeding method of dairy cow

Many of the dairy owners stated that bull service was the primary breeding method and artificial insemination was the main breeding method in urban and peri-urban of Holetta, Bishoftu, Sululta and Assela (Kiros, 2018). Similarly, Asrat et al. (2013) indicated that in the mixed crop/livestock production system of Boditti town 65.4% of the households use natural mating using local bulls, 35% of the households use artificial insemination (AI) and the rest (1.7%) use both natural mating and AI service. The study by Solomon et al. (2014) also indicated that 100% of the dairy farmers in Metekel zone, Northwest Ethiopia depend on natural mating to inseminate their cows. In Borana zone, on average 75% and 84.2% of respondents of lowland and mid-highland areas respectively, replied that they used natural bull service for breeding system (Dejene, 2014). In line to this, Desselegn et al (2016) stated that in Bishoftu and Akaki towns 50.8% and 46.4% of the respondents used artificial insemination (AI) as breeding system for their dairy cattle. However, Asrat et al. (2013) reported that 51.7% of the households in the urban system of Boditti town were used natural mating by local bulls and the remaining 48.4% used AI. The differences could be determined by access and cost of AI service, ease of getting preferred service, access of breeding bull and farmers’ awareness. On other hand, a result reported by Misgana et al. (2015) in East Wollega zone Ethiopia stated that majority of the dairy owners (50.5%) used both natural and artificial insemination for breeding their dairy cattle.

CONCLUSION

Although it is the most important aspect in animal production for economic benefits, the production and reproduction performance of dairy cows have been limited for a long period of time by several constraints. Consequently, the country’s dairy cow are characterized by low daily milk yield, long calving interval and longtime taken to reach age at first calving. However, daily milk demands of the country’s population and price of one liter of milk is increasing dramatically every day. Housing, feeding, breeding, weaning and culling systems were the core issues in improving the productivity of dairy cow while record keeping was not being effectively practiced by dairy producers due to the lack of awareness about its benefits. Therefore, it should be emphasized to ensure and enhance improved management practices by the dairy farmers.

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