

Reproductive Performance of Indigenous Cow Breeds of Ethiopia: A Review

Alemitu Adisu^{1*} and Wondosen Zewdu²

¹AGE Dairy and Poultry Farm, Hawassa, Sidama Region, Ethiopia

²Gorche District Office of Livestock and Fisheries, Gorche, Sidama Region, Ethiopia

*Correspondence to: Alemitu Adisu, AGE Dairy and Poultry Farm, Hawassa, Sidama Region, Ethiopia, USA, E-mail: alemituadisu2020@gmail.com

Abstract

The aim of the review is to condense the information about reproductive performance of different indigenous dairy cattle breeds of Ethiopia on parameters viz. age at first calving (AFC), calving interval (CI), day open (DO), number of service preconception (NSPC). These parameters also affected by different factors associated with either to the management such as method of husbandry, feeding system, estrus detection, semen quality handling as well as factors related to cow's management such as age, body condition score, post-partum problem, disease event, milk yield and genetics, feed shortage/poor nutrition with poor husbandry and herd health management are important factors that contributed to reproductive inefficiency. Appropriate feed resources and reproductive health management, a reliable AI service and an appropriate level of husbandry could be the management options to reduce/alleviate some of the prevailing problems related to reproductive efficiency. Thus the responsible body; ministry of agriculture has to be given more emphasis to reduce the influence of different factors on the reproductive performances of indigenous cattle through enhancing the skills of expertise and farmer by providing different level of training as well as by providing different inputs on appropriate time.

Keywords: Ethiopia; Indigenous cattle; Performance; Reproductive efficiency

Introduction

Ethiopia is believed to have the largest livestock population in Africa. This livestock sector has been contributing considerable portion to the economy of the country and still promising to rally round the economic development of the country. The total cattle population for the country is estimated to be about 53.99 million. Out of this the female cattle constitute about 55.48% and the remaining 44.52% are male cattle and 98.95% of the total cattle in the country are local breeds and remaining are hybrid and exotic breeds that accounted for about 0.94% and 0.1%, respectively Central Statistical Agency [1].

So far the Ethiopian indigenous cattle breed are identified as Arsi, Boran, Horro, Sheko, Fogera, Barka, Highland zebu, Metema highland zebu, Ogaden, begat, Afar, Adawa, Karayo, Orado, Goffa, Somalia, Hammer, Medenes, Bale, Ambo, Jijiga and Aergeue [2]. All of these cattle type were described as having considerable adaptability to harsh climate, poor nutrition and disease anemic to their respective area. The productivity of the cattle depends largely on their reproductive performance.

Regarding to Ethiopian dairy production system, like most dairy production systems found in the tropics, the Ethiopian dairy production system includes large numbers of cattle from small to large sized and subsistence to market oriented farms. 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 [3]. Smallholder dairy farms in Ethiopia particularly in Regional and Zonal cities are alarmingly increasing because of high demand of milk and milk product from resident. However, the existing farming system which holds maximum of 10 or 15 cows per individual is not satisfactory to fulfill the demand. Similarly, the study reported by [4,5] indicated that, the reproductive performance of dairy cows was found to be less than the optimum values desirable for profitable milk production in different parts of Ethiopia. This is mainly due to low milk production performance of the local cattle as well as the effect of low inputs and husbandry system. Moreover the production performance is associated with reproductive performances and thus any significant influences on the reproductive performances directly affect the production performances, therefore giving emphasis for the traits

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related to reproduction is very vital for better product and productivity from indigenous cattle.

The reproductive traits; age at first calving (AFC), number of service preconception (NSPC), day open (DO) and calving interval (CI) are some of the very important traits of reproduction and they are bases for profitability of dairy farming at different levels of the country [6,7]. Factors affecting reproductive performance are associated to either the management factor (such as method of husbandry, feeding system, estrus detection and semen handling or the factors such as age, body condition score (BCS), post-partum problem, disease event, milk yield and genetic potential.

The average lactation of milk production from an indigenous cow ranges from 494-850 kg (1.62-2.79 kg/day) under optimum management [8]. So appropriate reproductive management methods to be implemented across different dairy production systems of Ethiopia. It is imperative to obtain baseline information regarding the reproductive performance and factor affecting indigenous dairy cattle, by then it will be possible to devise appropriate management inputs in order to improve reproductive efficiency of dairy cattle and ultimately increase productivity of sectors. Reproductive traits are crucial factors determining the profitability of dairy production [8], and poor reproductive performance, exposed as prolonged calving intervals can result in reduced milk yield and increased culling rates and replacement cost [9] similar with the report [10] that showed calving interval, daily milk yield, lactation length and age at first calving are one of the major numerous measures of reproductive performance parameters for dairy cattle production. Therefore, the present review was under taken to assess the reproductive performances of indigenous dairy cattle in Ethiopia. which would help to suggest the future genetic and non-genetic improvement options for the producers to enhance their profit.

Reproductive performance of Ethiopian indigenous dairy cattle

The reproductive performance is one of the most concerns of the modern dairy industry over the worldwide, and it is characteristic of outstanding importance in dairy cattle business/farming and often a major determinant of biological and economic efficiency of livestock production in tropics [11]. 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. 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 [12]. Similarly, the reproductive performance commonly evaluated by analyzing female reproductive trait [7]. High reproductive efficiency for milk production has an important influence on herd profitability [13]. Generally, the main indicator that would be considered in assessing reproductive performance are age at first calving, calving interval, day open, number of service preconception [6]and [7] .

Age at first calving (AFC)

Age at first calving is the age at which heifers' calves for the first time. The beginning of productive life the heifer is called age at first calving. The AFC several studies carried out for local cows are varying across to the different breeds/types. The desirable age at first calving in local breeds is 3 years, even if the recommended heifers calve between 23 and 25 months of age, which is considered as optimum that increase profitability of the dairy business. AFC is one of the important factors contributing to economic return and is determined partially by farmer policy. AFC is affected by different factors like; breed/type nutritional status and management differences of dairy cows. Average of AFC of different Ethiopian indigenous cattle breeds is described in table (1). As different studies indicated that, the average of lower AFC was recorded from Arsi breed of cattle with the average AFC of 33.9 months and it is lower than other indigenous cattle breeds of Ethiopia. Age at first calving closely related to the rearing intensity and it has an impact on breeding program; mainly on the generation interval and response to selection. Age at first calving is directly affecting by nutrition, year and month of birth [14] (Table 1)

No.	Breed	Age at First Calving in months	References
1	Fogera	51.4±0.05	[16]
2	Horro	57.69±1.11	[17]
3	Arsi	33.9	[18]
4	Boran	57.6	[19]
5	Barka	49.2 ± 4.43	[19]
6	High land zebu	53	[18]
7	Ogaden	50.3	[20]

Table 1: On station performance of AFC of some indigenous cow breeds in Ethiopia.

Calving Interval (CI)

Calving Interval (CI) is the gap between two successive calving or a time elapsed between two consecutive successive parturitions, and ideally should be 12 to 13 months. CI probably the best index of a cattle herd's reproductive efficiency. The calving interval can be divided into three periods: gestation, postpartum anestrus (from calving to first estrus) and service period (first postpartum estrus to conception) [14]. It is highly related to the fertility trait and it can be used in selection programs to minimize the negative effects. Calving interval is closely matched to the yearly production cycle and influence the amount of milk production from cows. The average CI of some indigenous cattle breeds of Ethiopia is described here in (Table 2). Among the indigenous cattle breed of Ethiopia, the shortest calving interval (CI) was recorded from Horro breed of cattle with the average calving interval of 13.59 ± 0.26 months and it is characterized with good reproductive efficiencies.

NO	Breed	Calving Interval	References
1	Fogera	21.18 ± 0.7	[16]
2	Horro	13.59 ± 0.26	[17]

3	Arsi	14.2 and 45	[18]
4	Boran	20.8	[19]
5	High land zebu	15.1	[4]
6	Ogaden	16.4	[20]

Table 2: Calving interval of some indigenous cow breeds in Ethiopia.

Number of service preconception (NSPC) requires for successful conception and it depends largely on breeding system that the farmers have been employed, reproductive health of animals, the management and feeding practice bulls [15]. Number of service preconception is influenced by season that related to availability of feed, placenta expulsion time, lactation length, milk yield and parity [16]. The average number of service preconception of some indigenous Ethiopian breeds of cattle is described. According to the report of different studies, Barka cattle breed is characterized with a lowest estimate (1.11 months) of NSPC compare to the rest Ethiopian indigenous cattle breeds. Such trait is a good indicator of best reproductive performance of the cattle and therefore Barka cattle breed is the best indigenous breed of Ethiopian cattle with best reproductive performance efficiency. According to the report of [17], an exotic pure breed Holstein Friesian and their $\frac{3}{4}$ cross with Fogera breed cattle perform with an estimated value of 1.4 and 1.3 NSPC in central highland of Ethiopia, respectively. That was relatively higher number of service preconception compared to F1 cross (1.25). This showed that, NSPC is highly associated with breed differences and other husbandry practices.

Day open is the period between calving and conception in cows. Day open influenced by the length of time for the uterus to completely involute and resumption of normal ovarian cycle, occurrence of silent ovulation, accuracy of heat detection, management of semen quality and skill of inseminator or efficiency of bull. Day open affects lifetime production, generation intervals and annual genetic gain. According to the report of [4] and , 88.13 ± 2.03 days were recorded as an average day open from Horro cattle breed and it is the lowest day open records comparing with the other Ethiopian indigenous breeds of cattle.

Factors affecting reproductive performance associated to either the management factor such as method of husbandry, feeding, estrus detection, semen handling and cow management or factors related to cows such as age, body condition scoring, post-partum problem, disease events and associated to genetics of the animal. Some of the major factors are described as follows;

Breed type and Blood level

Crossbred had apparently better conception rate and fewer number of services per conception compared to local breeds and also the finding indicates Zebu cattle exhibited less intensive symptoms of heat and remained in estrus for shorter period than temperate breeds, it may be the reason for poorer calving rate and NSC of local cows. According to study by indicated that, crossbred cows required 0.12 and 0.24 fewer numbers of inseminations per conception than Ethiopian local breeds of cows in the highland and lowland stations, respectively. Indigenous breeds of cows which inseminated with Jersey semen required 0.35 more number of

inseminations per conception than those local breeds of cows inseminated with Friesian semen. On the other hand, crossbred cows inseminated with Jersey semen required 0.23 less number of insemination per conception than those inseminated with Friesian semen. The crossbred cows required 0.23 and 0.81 fewer numbers of inseminations per conception than the local breeds when they are inseminated with Friesian and Jersey semen, respectively, as they approached peak lactation. Parity exerted a significant effect on the number of service required per conception, on both days open and calving interval. The NSPC decreased from 2.1 in the first parity to 1.6 in the fourth parity. In the first parity cows, the cause of this age related difference in reproductive performance might be due to delayed resumption of ovarian activity after calving. The study by stated that, long calving to first service interval (CFSI) could result 16 months from poor breeding and due to the influences of genetic (breed) and non-genetic (parity, calving year, calving age and weight, body weight gain) factors. The heritability of days to first breeding (service) is generally low which suggests that improvement of the calving to first service interval is mainly possible through the improvement of non-genetic factors [18].

Feeding Practices

Nutrition has the major limiting impact on productive and reproductive performance in all animals. It also plays a major role on enhancing reproductive efficiency of dairy cows. Energy and protein are the major nutrients required in the greatest amounts and should be in the top most priority to optimize reproduction in dairy cattle; but also minerals and vitamins cannot be neglected and must be optimum in the diet. The study also indicated that, nutrient should not be over-fed as this may also impair the reproduction. Environmental factors, especially nutrition, determine pre pubertal growth rates, reproductive organ development, and onset of puberty and subsequent fertility may advance or delay AFS and AFC. This substantial evidence exists that dietary supplementation of heifers during their growth will reduce the interval from birth to first calving, probably because heifers that grow faster cycle earlier and express overt estrus. Energy deficiency, particularly in postpartum cows, is most likely the major feeding factor involved in poor reproductive performance of dairy herd. It results from the feeding of poor quality forages, which in most cases is coupled with inadequate supplementation.

Breeding practices

Management factors such as accuracy of heat detection, timing of insemination, proper insemination techniques, semen quality, proper semen handling and skills in pregnancy diagnosis have been reported as a cause for the decrease of NSPC. Poor estrus detection by herdsman, poor estrus expression of cows also contributes to long CFSI. Similarly, study by indicates, proper heat detection, feeding and postpartum reproduction management may reduce NSPC, and hence could be a possibility of reducing days open and calving interval. Furthermore, study by revealed that, changes in management and environmental condition from year to another year delays age at first service and calving [19].

In Ethiopia, the use of bulls for natural service is widespread. Uncontrolled natural mating is the leading form of animal breeding system that is practiced under extensive husbandry in rural areas. It

is also corroborates with studies by who described that natural mating prevails under extensive livestock husbandry system especially in rural areas. Similarly, the study report of [20] specified that Ethiopian farmers prefer natural mating due to because of the conception efficiency from AI services are always low. Natural mating bulls can be used for either free mating in the range land or controlled mating. In free mating in the range land bulls can carry out heat detection and cows in heat are mated by bulls several times during each heat period and in controlled mating heat detection is carried out by the owner of the cows and cows mate once or twice in each period.

Conclusion

The reproductive traits (AFC, DO, CI, and NSPC) of Ethiopian indigenous dairy cattle are characterized with low reproductive performances due to several factors. Breed type and Blood level, Feeding practices and Breeding practices are the major influencing factors for the low performing potential of Ethiopian Indigenous cows. Most reproductive trait have low heritability and the progress can be achieved by paying attention to management factors, especially improving the level of nutrition and feeding practices, the breeding practices, and reproductive health management are mainly required and also other essential factors such as heat detection and Husbandry practices. Generally, due to the Indigenous dairy cattle breeds has an ability for better adaptability to different environmental conditions; there should be a controlled cross breeding and selection strategy in line with conservation of the local adaptive traits of the breeds and Awareness creation training for producers on heat detection, feeding and feed ration formulation, housing, record keeping with better health care management which should go hand-in-hand to keep with right reproductive performance.

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