

## Research Article

# Productive and Reproductive Performances of Indigenous Dairy Cattle in Ethiopia. A Review

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### Abstract

This senior seminar was conducted to review the reproductive and productive performance of indigenous dairy cattle in Ethiopia. The age at first service in different indigenous breed of cattle are 55 month, 44.8month, 53.9month, 34.4month for Horro, Fogera, Borana and Ogaden cattle respectively. The average age at first calving was 35-53 months, calving interval was 12-24 months, number of services per conception was 2.1, days open was 250 days and reproductive lifespan of breeding female and male was 11-13 and 6.5 years respectively. The milk yield and lactation length was 1.09 liter/day/cow and 273.9 days respectively. The major problems for dairy cattle productivity in the Ethiopia were shortages of feed, diseases, repeat breeding and poor veterinary service, inadequate supply of improved cattle breeds and poor breeding system. The reproductive and productive performance of indigenous dairy cow in the Ethiopia was low, thus it calls attention to improve management system to improve the reproductive and productive performance of dairy cows.

**Keywords:** Dairy ; Ethiopia ; Performance ; Production ; Reproduction ; Review

### Introduction

Ethiopia has diverse agro-ecologies suitable for different kinds of livestock production. The livestock resources play important economic and social roles both at household and national levels. They sustain and support the livelihood of about 80% of the rural population and make significant contributions to the national economy and foreign currency earnings of the country [1]. The livestock sector contributes about 17% of the overall gross domestic product (GDP) and 45% of the agricultural GDP of the country [2]. The total livestock population in Ethiopia is estimated to be about 63.09 million cattle, 30.7 million

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sheep, 30.2 million goats, 1.21 million camels [3]. Despite the largest cattle population, the productive and reproductive performance is poor due to a number of reasons among which is the low genetic capacity of the indigenous cattle. Feed shortage, disease prevalence, low level of management, lack of proper breeding management such as lack of accurate heat detection and timely insemination might have contributed considerably to long days open, late age at first calving, long calving interval, short lactation length and low milk production influence on productive and reproductive performance of cattle [4]. According to the report of in spite of the largest cattle population, the milk production performance is very low. The country's per capita milk consumption is estimated to be about 19.2 kg per year which is far below when compared to the average per capita consumption of Africa (37.2 kg per year). The indigenous breeds of tropics are attributed to natural selection to the tropical environment and management. They are well known for their adaptability, hardiness, disease resistance, heat tolerance, low feed supply and low management level. In order to improve the low productivity of local cattle, genetic improvement of the indigenous cattle has been proposed as one of the options. Genetic improvement of the indigenous cattle, basically focusing on crossbreeding, has been practiced in Ethiopia [5]. The productive and reproductive performance of local cows is low indicating the requirement for strong intervention to get to the bottom of the constraints to assure increased productivity of dairy cows [6]. Reproductive and productive performance traits like age at first service (AFS), Age at first calving, Number Of Services Per Conception (NSC), days open (DO) and Calving Interval (CI), milk yield and Lactation Length (LL) are the basis for a profitable dairy farming [7].

### Objectives

- To review the reproductive and productive performances of indigenous dairy cattle
- To identify constraints of reproductive and productive performance of indigenous dairy cattle.

## Reproductive and Productive Performance of Indigenous Dairy Cattle in Ethiopia

### Reproductive performances

The productivity of cattle depends largely on their reproductive performance [7]. Reproductive performance is biologically crucial phenomenon's, which determine the efficiency of animal production [8]. Reproductive efficiency of dairy cows is influenced by genetic, season, age, production system, nutrition, management, environment and disease. However, in many cases, it has been measured mainly by considering parameters such as age at first service, age at first calving, days open, calving interval and number of services per conception.

### 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 (Table 1).

Breeds	Age at first service	Sources
Horro	55 months	Zawudie (20100)
	48.84	Kassahun et al (2015)
Fogera	44.8 months	Giday (2001)
	47.2	Damite et al (2015)
Boran	53.9 months	Ababu (2002)
Ogaden	34.4 months	Getinet (2005)
Arsi	33.8	Gabriel et al (1983)

**Table 1:** Age at first service in different indigenous breed of cattle.

The management factor especially nutrition determines pre-pubertal growth rates and reproductive development [9]. Delay in the attainment of sexual maturity leads to economic loss, due to an additional, non-lactating, unproductive period of the heifer/cow over several months. Better managed and well fed heifers grew faster, served earlier and resulted in more milk and calves produced during the lifetime of the animal.

### Age at First Calving

First calving results the beginning of an indigenous cows for productive life and influences both the productive and reproductive life of the female, directly through its effect on life time calf crop and milk production and indirectly through its influence on the cost invested for up-bringing and it is influenced by the time of conception [10]. The results of the study which conducted by Kumar et al (2014) showed that the mean age at first calving (AFC) was found to be 42.1±2.6 months. In Ethiopia the productivity of the indigenous breed is low. Usually cows do not produce their first calve earlier than 35-53 months of age. Prolonged age at first calving (AFC) will have high production in the first lactation but the life time production will be decreased due to less number 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 [11].

Different factors could cause to advance or delay age at first calving such as environmental factors like nutrition, health, routine management, climate; these are pre-determine for pre-pubertal growth rates, reproductive organ development, and onset of puberty and subsequent fertility [12] Table 2.

Breeds of cows	Age at fist calving (months)	Source
Horro	57.69 ±1.11	Hussin (2020)
	57.69 ± 1.11	Sisay 2015
	51.73 ± 6.97	Bekuma et al (2020)
Boran	57.6	WHO (2019)
	54 ± 0.05	Azage et al 2009
	36-45	DARGIS (2008)
Ogaden	50.3	Cui et al (2019)
	49.2 ± 4.43	Getinet et al (2009)
Fogera	50.8 ± 0.36	Melaku et al (2011)
	55.44 ± 6.72	Melaku et al (2011)
Arsi breed	33.9 months	Solomon (2016)

**Table 2:** Age at First Calving.

### Calving Interval

The calving interval (CI) is a period between two consecutive parturitions and should ideally be in the regions of 12 to 13 months [13]. However, calving interval in Ethiopian Zebu range from 12 to 24 months [14-16]. Which varies among breeds and animals within a breed. Longer CI might be indicative of poor nutritional status, poor breeding management, lack of own bull and artificial insemination service, longer days open, diseases and poor management practices. It is more profitable to have one calf yearly in cattle. If the CI is more, the total number of calving in her life time will be decreased and also total life production of milk decrease. The mean of number of calves born by a cow for lifetime indigenous cattle (6.84) reported by Dejene (2014). Calving intervals have low heritability and can be improved through nutrition and early breeding (Table 3).

Breed of cattle	Calving interval(days)	sources
Arsi breed	430	Gabriel et al., 1983
	426	Solomon (2016)
	439	Gabriel et al., 1983
Horro breed	523 days	Rege et al., 2006
	450.9 ± 31.2	Bekuma et al (2020)
	407.7 ±7.8	Sisay 2015
Fogera breed	525 days	Rege et al ., 2006
	21.18 ± 0.7 month	Assemu (2016)
	25.5	
Boran	489	DARGIS(2008)
	622.6	Yifat (20
Ogaden	492.9 ±13.23	Getinet 2009

**Table 3:** Calving Interval in different indigenous breed of cattle.

### Number of Services Per-conception

Number of services per conception has been defined as the number of services required for a successful conception. Number of service per conception (NSPC) depends largely on the breeding system used. It is higher under uncontrolled natural breeding than hand-mating and artificial insemination [17]. NSPC higher than 2 should be considered as poor (Mukassa-Mugrewa 1989). Appropriate and in time heat detection and insemination could be attributed to lower or higher number of service of per conception [18].

Indigenous cows had the significantly longest NSC (2.1) than that of HF crossbreds (1.5). Nigussie (1992) who in his report indicated that high numbers of services per conception are correlated with the problems associated with poor semen quality, poor semen handling practices and poor insemination practices and season; that is related to availability of feed, placenta expulsion time, lactation length, milk yield and parity [19, 20] reported that the average number of Number Of Services Per Conception (NSC) of indigenous cattle is was 2.2 ± 0.2.

### Days Open

Days Open (DO) measures overall reproductive performance for the previous 12 months. This is the interval in days between calving and successful insemination. This is more reliable parameter when determining the reproductive efficiency of a dairy herd to attain an

optimal calving interval of 12-13 months, cow should conceive within 85-110 days after parturition [21] reported 215 days and 250 days of DO for highland and lowland zebu cows, respectively. The length of days open in Arsi breed as reported by Gabriel et al ( 1983) is 349 days. Reproductive parameter is influenced by Feed shortage, silent estrus and lack of proper heat detection might have contributed considerably to the long days open [22] Also influenced by estrus detection rate, conception rate, voluntary waiting period and culling [23-25].

### Productive performances

#### Milk Yield and Lactation length

Indigenous breed of cows are generally considered as low milk producers. 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. The lactation yield in Ethiopian breeds is very low compared to exotic breeds and this is depending on number of calving, frequency of milking, persistency of yield. Breed of cows, season of lactation and management were significantly influenced cows’ milk yield per day and per lactation [26-28]. According to the research conducted by [29] the average milk production per lactation for indigenous cattle is 311.6 ± 43 liters in 239.3 ± 49 days. Even though the daily milk yield of local dairy cows considered as low it varies fore instance Abera et al (2018) 1.51 ± 0.08 liter/day, Zewidie (2010) 1.5 ± 0.3 kg/day, 1.45 liter/day, Beriso et al. (2015) and Demissu et al. (2014) for indigenous dairy cows based on availability of feed and the difference in the practice of keeping selected cows among farmers in different agro ecologies. The average daily milk yield of local animal can vary across the production system for example Melku (2017) found that 1.6 ± 0.5, 2.3 ± 0.4 and 3.2 ± 2 in rural, peri-Urban and Urban, respectively. Tomaselli (2011) stated that under optimum management, the average milk production per lactation from an indigenous cow ranges from 494-850 kg (1.62-2.79 kg/day) under (Table 4).

Breed of cattle	Milk yield per lactation(liter)	sources
Boran	490	EARO(1999)
	328.3±16.56	Azage et al (2009)
	947 ± 42.3	Gebregziabher (2013)
Horro	675	EARO (1999)
	1202 ± 37.9	Gebregziabher (2013)
	254.88	Bekuma et al (2020)
	302.62	Kassahun et al (2015)
Fogera	551	Addisu (2010)
	270	Rege et al (20060)
Arsi	809	Gabriel et al (1983)

**Table 4:** Average Milk Yield of Local Breeds.

#### Lactation length (LL)

Lactation length is the time period through which a cow continues giving milk in one parturition [30].The average lactation period per indigenous cow in Ethiopia is estimated to be about six months. According the work of Mulugeta and Belayneh (2013) the average lactation length in North Showa zone showed for local breeds is 273.9 days Beriso [also reported, the lactation length in Aleta Chukko District was 9.93 ± 0.2 months. Kedija & Adebabay stated, the average

lactation length of local cows was 7.29 months at Meiso 9.8 months at Bure District, respectively. Study conducted in North Showa zone indicated that local breeds had (273.9 days) shorter LL than the standard lactation period (305 days [31-33]. This might be due to the reason of poor nutritional (Table 5) status, poor breeding management, diseases and poor management practices [34].

Breeds	LL	source
Arsi	272	Gabriel et al (1983)
Horro	214.5 ± 3.9	Bekuma et al (2020)
	274.5	Kassahun et al (2015)
Boran	210	ARGIS (2008)
	177 ± 4.2	Azage et al (2008)

**Table 5:** LL: Lactation Length.

#### Reproductive lifespan of breeding female and male cattle

According [35] the overall mean of Ethiopian local cow reproductive lifetime was 11 to 13 years. The difference in reproductive lifespan of cattle could be management, breed age at first puberty and calving. The lifetime productivity of a cow is influenced by age at puberty, age at first calving and calving interval genetic makeup and the health status of the cow and management and feeding standards. The mean reproductive lifespan of male indigenous breeding cattle was 6.5 years [36-39]. The reproductive life time of the breeding male due to the fact that, in addition to breeding, males are employed for traction purpose which shorten their lifespan [40].

#### Major Constraints of Indigenous Dairy Cattle Production

There are technical, institutional, policy and socio-economic challenges that reduce the reproductive and production potential of cattle [41]. Azage et al. (2013) reported that the major constraint of dairy cow production are shortage of feed resource, disease outbreak, lack of supplementary feed and problem of extension services (credit access, AI services, veterinary services, new technologies) and other related problems to affect the dairy production system on smallholder farmers. Inadequate supply of improved cattle breeds, poor breeding system also the problems of cattle production in Ethiopia [42,43] Major constraints affecting milk production potential of dairy cattle in the most of the indigenous cattle which gives to low milk output. There are different constraints affecting milk production potential of dairy cattle in most part of Ethiopia including shortage of grazing land disease and parasite, shortage of land for cultivation of improved forage, inadequate veterinary service, low milk production potential of local [44-46] zebu cattle.

According to the finding of [47] Feed shortage, some of the farmers have reported that there is about 34% of feed shortage as reported non availability of forge round the year followed by high cost of feeds. Seasonal demand for milk and milk products was identified as one of the problems (23%) as pointed out by dairy farmer followed by low price of milk. shortage of feed, repeat breeder, diseases and shortage of veterinary are the major problems affecting livestock productivity in sidama zone, southern Ethiopia [48]. Another researcher [49] stated that feed shortage, disease, lack of improved dairy cow breed, water scarcity and market problem were identified and In highland and midland feed shortage occupied the first position followed by disease, lack of improved breed, water scarcity and market problem in that order. The livestock sub-sector in general and the dairy

sub-sector in particular does not make a contribution to the national income considering with its size. The reason for this is numerous [50] and includes both non-technical and technical constraints.

Non-technical constraints: the non-technical constraints of dairy development generally include a variety of socio-economic and institutional considerations, which is most cases and are will common constraints to other agricultural sector in the country [51-53].

Technical constraints are: animal health disease, feed and nutrition and genotype.

Animal health and [54] improved management is also one of the major constraints of dairy development in Ethiopia, which cause poor performance across the productive system.

The quality of feed also deteriorates during the dry season in both the mixed farming and pastoral system [55-56].

## Conclusion

The dairy sector in Ethiopia is characterized by a poor productive and reproductive potential of indigenous cows. The cause of poor reproductive and productive performance in indigenous dairy cattle are late age at first service, delayed age at first calving, long calving interval, high number of service per conception, long day open, low milk production and short lactation length. The major constraints of dairy cattle production in Ethiopia were feed shortage, disease problem, and lack of supplementary feed with technological constraints. Considering dairy animal traits and production constraints are instrumental in improving reproductive and productive performance of local dairy animals.

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