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Review on Reproductive and Productive Performance of Fogera Cattle

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Abstract: This review was conducted to assess the reproductive and productive potential of Fogera cattle in comparisons with other indigenous cattle breeds. The overall least squares mean of number of services per conception (NSC) of Fogera cattle was ranged from 1.28± 0.06 to 2.0±0.65 and the overall least squares mean of days open (DO) was found to be 151±13 days to 286.5±4.5 days. Similarly the overall mean calving interval (CI) was varied from 437.4 days to 587±5.44 days as reported by different researchers in different time. The season and a year of calving had its own influence on caving interval. The least squares mean age at first calving (AFC) of Fogera cattle was 39.8±5.6 months to 46±0.28 months. The overall least squares mean gestation length (GL) was 279± 0.31 days to 283±0.26 days. The overall calf mortality rate which is an important aspect of dairy operations was 4.9 ± 1.3, 6.8 ± 1.4, 7.3 ± 1.7 and 10.1 ± 2.0 and 1.6 ± 0.8, 3.9 ± 1.3, 4.7 ± 1.5 and 8.3 ± 2.2 at the end of 30 days (neonatal period) 180, 240 (pre weaning) and 360 days of Fogera and their f1 Friesian crosses respectively. The overall mean milk yield was varied from 1.44±0.43 kg /day to 2.0 kg/day, 872 kg per lactation and the best 50 and 25% of the cows was 1156 and 1462 kg, respectively, with the maximum yield of 2817 kg. The overall mean of fat, protein, total solid, solid nonfat and ash was 5.01, 3.07. 14. 23, 9.22 and 0.70 respectively. The mean birth weight was 22kg pure Fogera and 23.5kg Fogera x Holstein Friesian cross. In addition the weights at one month, three month, six month, nine month and yearly age (35.1, 49.8, 68.2, 109 &113 kg) with an average daily body weight gain of (591±43.7, 374±31.9, 321±31.3, 359±40.4 and 272±57.6g) respectively. Generally the reproductive and productive performance of Fogera cattle are relatively better than the values reported for most other tropical and particularly Ethiopian cattle breeds. Moreover being the only one to adapt and perform well in Fogera swampy area magnifies the importance of it to the community.

Key words: Age at First Calving · Milk Yield · Mortality Rate · Birth Weight · Calving Interval

INTRODUCTION

Ethiopia is believed to be the leading country in Africa in terms of livestock resources estimated to be 53.99 million cattle, 25.5 million sheep, 24.06million goat, 1.91 million horses, 6.75 million donkeys, 0.35 million mules, and about 0.92 million camels in the sedentary areas of the country [1]. Out of these cattle are very important livestock species in the traditional mixed crop livestock production systems of Ethiopia by providing mainly drought power, a small amount of milk, meat usually when they retire and manure [2]. In addition, skins, hides and horns are used as raw materials for making a range of household items, agricultural tools and ornaments. Their manure is used to fertilize backyards and crop fields. Farm animals serve as insurance and a source of cash for rural farming communities and have a significant role in cultural and social ceremonies [3].

Moreover they are well adapted to the tropical environment producing and reproducing under stresses of high degree of temperature, high disease prevalence and low level of nutritional status. Even though, they are said to be low in milk and meat production, Cattle managed in medium scale production system showed better reproductive system [4].

After the initial cattle plague (Rinderpest) epidemic and decimation of the dominant Sanga populations, zebu cattle were introduced from Asia into Africa at various points on the east coast of the continent, and interbreeding with Sanga remnants resulted in several zebu-Sanga and Sanga-zebu admixture populations. The breeds that emerged from these crosses

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have been classified in a separate group of "Zenga" cattle [5]. The Fogera cattle developed out of interbreeding of Abyssinian Zebu from central highlands and the adjacent Sanga (Danakil, Raya-Azebo) breed are among the 27 recognized indigenous cattle breeds in Ethiopia and it is found distributed around Lake Tana in south Gondar and west Gojjam zone of Amhara region, Ethiopia [5-8].

Phenotypicaly, they are characterized as large size and tall animals with long legs. Their identifiable coat color being white with black spots or pure white, have small horns, very large dew-lap, pendulous naval flap and preputial sheath and they are docile [2]. Pied coat of black-and-white or black-and-grey; short, stumpy, pointed horns; hump ranges from thoracic to cervico-thoracic; dewlap is folded and moderate to large in size; docile temperament; used for draught, milk and meat [6, 9, 10].

The hump is small and cervical or cervico-thoracic in position representing the sanga influence. These cattle are as intermediate zebu- Sanga type, the so-called Zanga [11].

The population of Fogera cattle was estimated to be around 800,000 in 1980s [11] 15,000 heads in 2000s [12] and about 17,000 pure Fogera cattle [7]. This discrepancy in the number of Fogera cattle may indicate that the population is declining over the years due to feed shortage and genetic dilution, since the breed is the only source of milk and draught power to the local community in the marshy areas of Fogera plain and areas bordering Lake Tana, Fogera cattle is important in Ethiopian livestock economy. Fogera cattle is the only one to adapt and perform well in the heavy fly burden and the swampy grazing land of the area among Ethiopian cattle breeds [10]. However the number of Fogera cattle is declining from 800,000 to 17,000 (from 1982-2006). Therefore strategic management and conservation is indispensible to help the community in poverty reduction and food insecurity. The present review aimed to highlight the reproductive and productivity potential of Fogera cattle in the comparison of other indigenous cattle.

Number of Services per Conception: Number of services per conception is the number of services (natural or artificial) required for successful conception. The number of inseminations required to produce a live calf is one of the most useful parameters of reproductive efficiency which mainly depends on the breeding system used. It is higher under uncontrolled natural breeding than hand-mating and artificial insemination. The overall least squares mean (NSC) of number of services per conception of Fogera cattle is 1.54, [13, 14] 1.28+- 0.06 [2] and 2.0±0.65 [15] which is less than the indigenous cattle breeds' performance reported for highland zebu [16], 1.81 for Ethiopian Boran [17]. However it is higher than the finding of Haile-Mariam and Mekonen [18], 1.11 reported for Barka cattle.

Days Open: According to researchers deal about Fogera cattle the overall least squares mean of days open (DO) was found to be 285±4.3 (ranging from 183±15.1 to 311±16.2 days [2] 280±3.4 days [13] 286.5±4.5 [14] 151±13 days [19] different results reported in different time for the same breed. Factors like delayed resumption of ovarian activity after calving, longer interval to first oestrus and a brief shorter duration of oestrus along with its silent symptoms, scarcity and deterioration of available feeds, might have contributed to difficulty in heat detection and timely insemination of the cows resulting in prolonged DO [2]. Melaku *et al.* [2] reported that the lowest DO (183±15.1 days) was recorded in the year 2008, while the highest (311±16.2 days) was recorded in 2000 with a significant variation of up to 128 days within a breed. The increased DO observed in the years might be because of inconsistency in the level of management related to shortage of supplementary feed in dry period, poor oestrus detection, insufficient AI services, absence of regular follow up of breeder cows and other related technical problems. Giday [13] also reported similar effect of year of birth on DO on the same breed in north Gondar in another location. Several researchers have different ideas on the effect of parity of dam on DO on the same breed. Melaku *et al.* [2], Haile-Mariam and Mekonnen [19] and Agyemang and Nkhonjera [20] reported that parity of dam had no significant effect on DO. Whereas other researcher found significant influence on DO [13, 21].

Calving Interval: The overall mean calving interval (CI) of 587±5.44 days was reported by Melaku [2], 479 days Giday [13] and14.58±0.56 month (437.4 days) Tadele and Nibret [15]. The former two authors suggest that the longer calving interval obtained than the ideal value might be due to too long days open emanated from difficulties in heat detection and overall managerial activities and season of calving had a considerable effect on calving interval. Short CI was reported for cows which calved during the short rainy season than those calved during dry and long rainy season. This could be due to the availability of adequate pasture during this and the coming main rainy season which may enable the cow in

good condition during and after calving for re-conception in the following breeding season. On the contrary, cows calved during the main rainy season had the longest CI. This might be because of lack of green pasture and supplementary feed in the coming dry season and due to the incidence of skin disease (Demodex) during main rainy season.

A year of calving also reported that it had its own influence on caving interval. However, there was no clear trend of effect of year. The possible reason might be the differences in nutritional and management aspects between years [13, 18, 22].

A controversial statement has been reported by different researchers about the effect of parity of the dam on calving interval. The general trend obtained was calving interval decreases as parity increased. The longer calving interval in younger cows might be due to higher nutrient requirement for growth in addition to milk production and maintenance thus delays the onset of postpartum heat [2, 4, 13, 25, 26]. However, others [17, 20, 27] reported non-significant effect of parity on calving interval.

Age at First Calving: The time between birth and first calving represents a period in which replacement heifers are not generating income. Instead this rearing period requires considerable capital expenditures including feed, housing, and veterinary expenses.

The least squares mean age at first calving (AFC) of Fogera cattle was 44 ± 0.43 [23], 46±0.28 [13], 50.83 ± 0.36 [2] and 39.8±5.6 months [15] which is comparable with the value obtained for Ogaden cattle [24] for Boran cattle [28, 29] for *Bos indicus* cattle [23] and 49.37±0.25 for local cattle in Ilu Aba Bora Zone [31] but lower than 3.05±0.65 years for zebu and Holstein Friesian dairy cows in Jimma town [32]. Researchers stated that year of birth had significant effect on the age at first calving. Which means age at first calving increased as year goes [2, 13, 23].

Gestation Length: The overall least squares mean gestation length (GL) was 279± 0.31 days [13] and 283±0.26 days [2] which is in comparison to the report of Azage [33] for lowland local pure Zebu and Barka cattle, Ababu [26] for Boran cattle. However, the figure is higher than the finding of Enyew [22] reported for Arsi cattle.

Season of calving had a significant influence on GL that cows calved in the main rainy season had longer GL than those calved in the dry and short rainy seasons [2, 21, 23].

Parity also affected gestation length. Longer gestation length was observed in the seventh parity while shorter gestation length in the second parity showing that older cows carried their calves for longer days than younger cows because of relatively larger uterus [2]. Breed of sire had a considerable effect on gestation length. Cows mated to pure Fogera bulls carried their calves for 6.2 days longer than those artificially inseminated with Friesian semen Melaku [2]. Similarly, Haile-Mariam and Mekonnen [19] and Addisu [23] observed that cows mated to Fogera bulls carried their calves longer than cows inseminated artificially with Friesian semen on the same breed. This might be due to the reason that the birth process is initiated at earlier stage of gestation among fast growing breeds than among slow growing breeds [34]. It is also a general truth that gestation length is influenced by paternal genotype but not by maternal genotype.

Mortality Rate of Fogera Calves: Calf management is an important aspect of dairy operations. Calf health is important to the long-term success of operations because heifers are representing the future dairy herd. Moreover Health issues have a detrimental effect on calf growth and later performance of the milking cow. The newborn calf is almost unprotected against infectious diseases. Hence, proper cleaning and disinfection of the calving area between deliveries is extremely important in order to prevent the transfer of microbes that live in the calving area surroundings. The overall mortality rate of 4.9 ± 1.3, 6.8 ± 1.4, 7.3 ± 1.7 and 10.1 ± 2.0 and 1.6 ± 0.8, 3.9 ± 1.3, 4.7 ± 1.5 and 8.3 ± 2.2 at the end of 30 days (neonatal period) 180, 240 (pre weaning) and 360 days of Fogera and their f1 Friesian crosses respectively reported by Amuanmuta *et al*. [7]. Ayele Abebe [35] reported that the overall mortality rate of 3.8± 1.2 and 5.3±2.1 in teff-millet and rice-pulse oriented mixed crop livestock production system respectively.

Milk Yield and Lactation Length: The overall mean milk yield of Fogera cattle was (1.44±0.43 kg day-1 [36] 2.0kg/day [10] 1.74kg/day [37]1.90+0.13kg/day [8, 35] reported 551kg per292 days of lactation which means 1.89/day). At IAR stations, the milk yield of Boran, Horro and Barca cattle was 494, 675 and 559kg, respectively. Arsi and Fogera have similar production level, which was 872 kg per lactation. However, the milk yield of Fogera did not include the milk suckled by their calves; but the Arsi and Zebu at Asela station were milked without being suckled by their calves. When the milk suckled by their

calves is taken into account by considering growth rate of their calves, the total milk yield of Fogera cows would range between 1174 and 1220 kg. Further analysis of the milk yield of Fogera cows showed that the mean milked-out yield of the best 50 and 25% of the cows was 1156 and 1462 kg, respectively, with the maximum yield of 2817 kg. Accordingly only 5% of the Arsi cows yielded over 800 kg with yield of 1340 kg. Similarly, the best 10% of Horro cows at IAR averaged 1200 kg with the maximum yield of 1528 kg per lactation [38]. Therefore it is possible to state as this breed is relatively the best and very important one out of the available indigenous Ethiopian cattle breeds in terms of milk production.

However, most of on-station findings on the performance of indigenous cattle on milk and other associated traits showed very low figures [26]. The author who reports 1.44±0.43 kg day-1 stated that the low milk yield might be related to the stress due to confinement of the animals during the experiment period. These different results of the same breed might be attributed to the difference in management, feed quality, season, year of calving. Since all of this factor have a significant effect on milk yield and lactation length.

Two hundred ninety two (292) days of mean lactation length is reported by Addisu *et al.* [8] which is higher to the reports of IAR [39] for Horro cattle (229 days) and [40] for Barka cattle (279 days) in Ethiopia but it is less than to the lactation length of N'Dama cattle (411 days) kept under village management in the Gambia [41]. Addisu *et al*. [8] reported that the calving year, season of caving and parity of dam have significant effect on lactation length which is similar with Million and Tadelle [40], Agyemang *et al.* [41] and Gebeyehu [42] in year of calving, season of calving and Gebeyehu [42] parity of dam.

Milk Composition: The Milk Composition section describes the chemical and physical properties of milk. The species of dairy animal, its breed, age and diet, along with the stage of lactation, parity (Number of parturitions), farming system, physical environment and season influence the colour, flavour and composition of milk and allow the production of a variety of milk products. The overall mean of fat, protein, total solid, solid nonfat and ash of Fogera cattle was 5.01, 3.07. 14.23, 9.22 and 0.70 respectively reported by Hussien *et al*. [36]

Birth Weight and Weight at Different Ages: Growth rate and nutrient intake prior to weaning have been shown to have a significant effect on milk yield, superior to genetic selection for production. The mean birth weight of Fogera cattle (22kg) reported by Addissu *et al*. [8] which is comparable with the birth weight of other indigenous Ethiopian cattle breeds such as the Boran, Horro and Barka [43, 44]. The authors also stated that birth weight was significantly affected by breed of calf and birth year; crossbred calves (Fogera x Holstein Friesian) were (23.5kg) heavier than Fogera calves and calves born in 2002 were heavier than those calves born in 2003. The effect of breed might be because of the heterosis effect [43-45].

The weights at one month, three month, six month, nine month and yearly age (35.1, 49.8, 68.2, 109 &113 kg) with an average daily body weight gain of (591±43.7, 374±31.9, 321±31.3, 359±40.4 and 272±57.6g) respectively were reported by addisu *et al*. [8] and out of them the weights recorded at three months, six months and yearling age were almost similar with the weights reported for other breeds of cattle (eg., Horro, Barka, Boran) at their respective ages [43, 44].

CONCLUSSION

The reproductive and productive performance of Fogera cattle are relatively better than the values reported for most other tropical and particularly Ethiopian cattle breeds. However it is declining through time which implies the breed influenced by environmental factors or poor management as the result of several researchers indicate in the range of timeframe. Therefore 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.

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