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Production and Reproduction Performances of Local Dairy Cattle: In the Case of Rural Community of Wolaita Zone, Southern Ethiopia

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Abstract

The study was conducted to assess local dairy cattle production and reproduction performances in rural community of Wolaita Zone, Southern Ethiopia from January to May 2015. Multistage sampling method was used and it was collected from both primary and secondary sources. The collected data was analyzed statistically using SPSS (version 20) for windows. The study reported that in overall average, 1.723, 1.536, 1.59, 1.589, 1.49 and 5.704 of dairy cows, heifers, calves, oxen, bulls and total cattle per households, were found, respectively. The average values of dairy cows, calves and oxen numbers were declare significant variation across agro-ecologies, while heifers and bulls numbers were not significantly vary due to agro ecology effect in the study area. The study also showed that the average values of daily milk yield and lactation length were, respectively, 2.127 ± 0.094, 1.861 ± 0.084 and 1.989 ± 0.063 liters; 11.875 ± 0.748, 9.821 ± 0.661 and 10.802 ± 0.503 months in midland, lowland and overall in the study area and the values were declare significant between agro-ecologies. While values of 20.167 ± 1.177, 19.658 ± 1.186 and 19.913 ± 0.832 months were reported for calving interval; 4.022 ± 0.142, 3.926 ± 0.090 and 3.818 ± 0.104 years for age at first calving cow in midland, lowland and overall, respectively, however, they have no significant different in both parameters (calving interval, age at first calving across agro-ecologies (midland and lowland) in the study area.

Keywords: Wolaita zone; Agro-ecologies; Small-holder farmers; Heifers; Calves

Introduction

Livestock play a major role in the Ethiopian economy and its people by providing food, input for crop production, soil fertility management, raw material for industry, cash income, saving, fuel, social functions and employment. Ethiopia has the largest livestock population in Africa, estimated at 45,054,969 cattle; 20,562,832 sheep; 20,191,099 goats [1] and 2.4 million camels [2]. Nevertheless, productivity is generally lower than even in comparable African countries. The national per capita production of livestock and livestock products, export earnings from livestock and per capita consumption of food from livestock origin have declined since 1974 [3].

In many respects the dairy industry occupies a special position among the other sectors of livestock (agriculture). Milk is produced every day and gives a regular income to the numerous small producers. Milk production is highly labour-intensive and so provides a lot job opportunities [4]. In Ethiopia, the majority (99.25%) of the cattle population are local breeds, which are found in rural areas under subsistence type of farming system and the remaining are hybrid and exotic breeds that accounted for about 0.65 and 0.09%, respectively [5]. However, productive performances of cattle are very low even in comparison to other East African countries these may be due to animal diseases, unavailability of feed in terms of quality and quantity and genetic characteristics of animals [2]. The country has made great effort to improve the productivity of local breeds through artificial insemination (AI) program to crossbreed locally adapted cattle breeds with improved exotic dairy breed ones. This program addresses major parts of the country including Southern Nation, Nationalities Peoples and Regional State. However, the success of such programs is not satisfactory due to numerous factors, including substandard nutrition, poor husbandry practice and infrastructure status; more ever, such challenges are related by due to poor production and reproductive performances of animals as suggested by many dairy producers [6].

In general, the most part of Ethiopia, which are very well suited for dairying because a country is characterized by endowed with such enormous cattle resources and climatic situations conducive to cattle production as a result, it should be self-sufficiency in dairy products and should be encouraged to optimize the use of available resources to fill the gap between demand and supply. To improve dairy production, it is necessary to design appropriate and sustainable dairy development strategies based on 'felt' needs of smallholder farmers. Smallholder farmers represent about 85% of the population and are responsible for 98% of total milk production [7]. Milk is a cash crop and dairy farming is an investment option for smallholder farmers. So to ensure the success of the dairy production, regular supervision should be taken by evaluating the production and reproductive performances of the dairy cow under the prevailing management and environmental conditions since dairy cattle are important sources of food and income for smallholders, in the country Ethiopia. According to Le Blanc [8] dairy herd profitability is determined by dairy cows reproductive and production performance because it is a major determinant for overall productivity of dairy production systems by affecting the efficiency of milk production, the number of calves produced per cow and lifetime milk production [9]. As a result 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 [10]. According to Cavestany and Galin [11] and Pursley, et al. [12] study 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 in general, in particular Wolaita areas. Therefore, Having information on performances of reproductive and productive of local cows in the

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study area, wolaita Ethiopia would help to suggest the future genetic improvement options for this herd. The aim of this study was thus to determine the reproductive and productive performances of local cows of Ethiopia, in particular in wolaita areas.

Methodology

The study was conducted from January to May 2015 in Wolaita Zone, Southern Ethiopia. The study area is located in 6.4° to 7.1° north latitudes and37.4° to 38.2° east longitudes, and it covers a total area of 3, 982 km^2. Its altitude ranges from 1,200 to 2,950 m above sea level (masl), and it is subdivided into three agro ecological zones, namely, kolla or lowland (35%, <1,500 masl), woina dega or intermediate highland (56%, 1,500 to 2,400 masl) and dega or highland (9%, >2,400 masl). Wolaita Zone has a bimodal type of rainfall pattern. The major and minor rain seasons usually last from June to September and March to May, respectively. The average total annual rainfall is 1,014 mm, and the mean daily temperature is 19.5°C.

In current study area, multistage sampling method was used. From lowland and midland, respectively, Humbo and Bolesoserea woredas were selected randomly. From each selected Woredas, three districts were selected randomly thereby a total of six districts were selected. Again, from each selected districts, 25 households were selected purposively farmers who have dairy cattle. Thus, a total of 150 households were selected for interviewee survey study. However, some households were not committed to response the questions requested by researchers. Even though, however, more 100 farmers committed in giving response of requested questions in some parameters.

Data was collected from both primary and secondary sources. The primary sources were obtained through a semi-structured questionnaire; it was pre-tested the questionnaire before the actual data collection was carried. The interviews were conducted by trained research assistants under close supervision by the researcher while the secondary data were collected from different sources such as books, research publications, journals, office reports of zonal and woredas agriculture etc. The collected data was analyzed statistically using SPSS (version 20) for Windows. Both descriptive statistics and general linear model were used to analyzed the data; the values were considered significant at $p < 0.05$.

Results and Discussion

Local cattle holdings and herd structure

Least square means (±SE) of local cattle holdings and herd structure in different agro-ecology is presented in Table 1, revealed from Table 1, in average 1.723, 1.536, 1.59, 1.589, 1.49 and 5.704 of dairy cows, heifers, calves, oxen, bulls and total cattle, respectively were found in the hand of per interviewed respondents. In similar to the results of present study Dessalegn [13] in Bench-Maji Zone, Southwest Ethiopia reported that in average heads number per house hold for dairy, 1.91 ± 1.2; oxen, 1.54 ± 1.3; heifers, 0.58 ± 0.8; calves, 0.61 ± 0.8 (0.69 ± 0.8 males and 0.53 ± 0.8 females) and for total cattle, 5.64 ± 3.3. In the present study, even though, in all local cattle composition; dairy cows, heifers, calves, oxen, bulls and total cattle numbers were reported higher in lowland than midland areas however, only the numbers of dairy cows, calves and oxen were declare significant variation across agro-ecologies, between midland and low land while heifers and bulls numbers were not significantly vary between midland and low land in the study areas. Kedija et al. [14] from Mieso district Oromia Regional State, Ethiopia who reported that in average 5.69 ± 0.35 heads cattle holds individual households which was in consistent to current finding 5.704 ± 0.266 heads cattle holds in average per household. However, the result of current study was significantly lower than the result of Tesfaye [15] from Metema district, North west Ethiopia who found that 15.53 ± 0.71 heads cattle holds in average per household. Yoseph et al. [16] in urban and peri-urban dairy production system in the Addis Ababa milk shed who found that proportion of milking cows, 72.2%; heifers, 25.6% and calves 21.6%, to total number of cattle herd however, in the current study it was found as 21.733, 19.374, 20.055, 20.043 and 18.794 % proportionate to dairy cows, heifers, calves, oxen and bulls, respectively (Table 1). In agreement to current result, Yoseph, et al. [16] reported higher % dairy cows than other cattle herd. However, in the current finding, the actual proportion number of dairy cows was lower than Yoseph et al. [16] finding. The reason for being lower, in the present study is because of all of the cattle are indigenous Zebu in the herd; in turn, these cattle have multiple functions (for threshing, plowing, manure production etc.) for famers besides for milking but a study conducted by Yoseph et al. [16] is relatively market oriented and targeted to produce more milk by keeping more cows since sale of the milk is the major income for the farm. More ever, these farmers keep more exotic dairy genotypes besides local cattle.

Production and reproduction performances

Production performances:

a) Daily milk yield: There were significant variation in daily milk yield performances of these cattle (local) due to agro-ecology effect; the value of average daily milk yield was significantly higher in mid land (2.127 ± 0.094) than low land (1.861 ± 0.084). The overall average daily milk yield per cow reported in the current study area was 1.989 ± 0.063 liters (Table 2) which was in approximate to the results of studies conducted by Dessalegn [13], Brokken and Senaite [17], Mugerwa et al. [18], Azage et al. [16] and Fasil [19] from different part of the country Ethiopia who had reported that 2.06 ± 0.5, 2.0, 2.19, 2 ± 0.07 and1.8 liters, respectively. However, Merha [20] reported the daily average milk yield of Abergele cattle to be 0.75 liters which is lower than the present result of study. The value of average daily milk yield obtained from current study was significantly lower than values obtained from Minale and Yilkal [21] in Gomgofa zone, Southern Ethiopia who

Cattle Herds	Agro-ecologies			Percentage
	Mid land N(LSM ± SE)	Low land N(LSM ± SE)	Over all N(LSM ± SE)	
Dairy cows	67 (1.478^a ± 0.086)	74(1.946^b ± 0.096)	141 (1.723 ± 0.068)	21.733
Heifers	42(1.333 ± 0.147)	55(1.691 ± 0.113)	97(1.536 ± 0.092)	19.374
Calves	50(1.42^a ± 0.103)	67(1.716^b ± 0.09)	117(1.59 ± 0.069)	20.055
Oxen	39(1.308^a ± 0.098)	51(1.804^b ± 0.128)	90(1.589 ± 0.088)	20.043
Bulls	35(1.314 ± 0.121)	63(1.587± 0.095)	98(1.49 ± 0.076)	18.794
Total cattle	76(4.25^a ± 0.268)	76(7.158^b ± 0.395)	152(5.704 ± 0.266)	100

LSM: Least Square Means, SE: Standard Error, N: Number of Observations, Means within the same row in two agro-ecology, in the same parameters' with different super scripts letter are significantly different ($p < 0.05$).

Table 1: Least square means (±SE) of local cattle holdings and herd structure in different agro-ecologies.

Parameters	Agro-ecologies		
	Midland N (LSM ± SE)	Lowland N (LSM ± SE)	Overall N (LSM ± SE)
Age at first calving (in year)	57(3.818 ± 0.104)	65(4.022 ± 0.142)	122(3.926 ± 0.090)
Average milk yield/day/cow (in litre)	65(2.127^{b} ± 0.094)	70(1.861^{a} ± 0.084)	135(1.989 ± 0.063)
Lactation Length (in month)	64(11.875^{b} ± 0.748)	70(9.821^{a} ± 0.661)	134(10.802 ± 0.503)
Calving interval (in month)	60(20.167 ± 1.177)	60(19.658 ± 1.186)	120(19.913 ± 0.832)

LSM: Least Square Means, SE: Standard Error, N: Number of Observations, Means within the same row in two agro-ecology, in the same parameters' with different super scripts letter are significantly different ($p < 0.05$).

Table 2: Production and reproduction parameters in different agro-ecologies.

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. The reason for variation of daily milk production in different study might be due to the effect of feed, health, management aspect and genotype. In general, the cattle productivity, in the study areas is low in terms of milk yield which is in similar to other parts of the country Ethiopia under smallholder management conditions due to lack of proper supplementary feeding for the dairy cattle, poor nutritive value of pastures and forages offered to the animals besides, the farmers keep local animals that are generally low producers of milk [22,23].

b) Lactation length: As presented in Table 2, in the present study, the overall average lactation length was reported as 324.06 ± 15.09 days or 10.802 ± 0.503 months and it was found significantly varied between agro-ecologies. Thus, in midland areas (in the study), the local dairy cattle can be milking for longer period than lowland areas. This might be related with, in midland areas by nature there is exceptional longer rainfall period besides, normal rainfall as result there would be forage availability for milking cows for some extent. Belay et al. [24] from East Shwa, Shiferaw [25] from Jimma Town [24] and Kedja et al. [14] from Measo districts areas of Ethiopia who found that, respectively, 255.75 days of Keriyu cattle breed; 273.9 days of the crossbred dairy cows and 220 days of average location length of indigenous cattle which are significantly lower than the finding of current study (324.06 ± 15.09 days). More ever, Minale and Yilkal [21] found out for local breed cattle in Chencha and kucha districts as 7.42 ± 1.89 and 9.23 ± 2.27 months of average lactation length, respectively; Asaminew and Eyassu [26] also reported an average lactation length for local breed as 9.8 ± 2.26 months; these findings are also significantly lower than the finding of current study (324.06 ± 15.09 days). However, having longer lactation period in the current study probably implies that farmers in the study area milk cows until they are quite dry; it might be also related to feed availability as in most areas of the study, there is long rainfall. nevertheless, such type of milking practice has negative effect on calving interval, next season milk and productive efficiency of the cow.

Reproductive performances:

a) Age at first calving: Age at first calving is the indicator of beginning of a cow's reproductive life and is closely related to the generation interval. There is considerable economic importance associated with the factors that control the onset of ovarian activity of cattle. In the present study, the overall average for age at first calving cows was 3.926 ± 0.090 years or 47.112 ± 1.08 months however, there was no significant different between agro-ecologies (Table 2). Dessalegn et al. [27] in North-West Zone of Tigray who reported 21.6 months for Arado cattle breed which is significantly lower than current result of age at first calving cows. However, Dessalegn [27] from Benchi-Maji zone, Southern Ethiopia who found 50.87 ± 7.0 months which is higher than the result of current finding of age at first calving cows (47.112 ± 1.08 months). Minale and Yilkal [21] from Gomgofa zone, Southern Ethiopia indicated that 4.6 ± 0.8 and 4.4 ± 0.6 years of age at first calving for local breed Chencha and kucha districts study sites, respectively; Dejene [9] also from lowland and mid-highland agro-ecologies of Borana zone, Southern Ethiopia reported the mean age of first calving of cows are 4.9 and 4.8 years in lowland and mid-highland, respectively, which are also higher than that of the result obtained from present study (3.926 ± 0.090 years). Different factors could cause to advance or delay age at firs 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.

b) Calving interval: The average calving interval is present in Table 2, reveal from Table 2, overall average value of the calving interval was 19.913 ± 0.832 months. There was no significant difference between agro-ecologies (midland and lowland areas). The result obtained in the present study is in comparable with Dessalegn [9] from Benchi-Maji zone, Southern Ethiopia who indicated 21.18 months and Shiferaw [25] reported the mean calving interval for kariyu cattle in the East Shwa zone of Oromiya to be 18 months of calving interval. However, the value of average calving interval present finding was shorter than from Merha [20] resulted from Abergele breed who found 24 months. Dejene [9] from his study in lowland and mid-highland agro-ecologies of Borana zone, Southern Ethiopia found that the calving interval of cows are 16.8 and 13.8 months in the lowland and mid-highland area, respectively which is significantly lower than finding of current study (19.913 ± 0.832 months). The causes of variation for average value of calving interval in different study may be due to the effect of genotype (breed), feed availability year-round, management (nutrition, health, housing conditions etc.) and climate type where the animal live. The supposed reasons for the shorter calving interval might be for the availability of ample feed resources from crop residues, natural pasture and less prone of an area to recurrent drought and suitability of climate. On the other hand, however, the longer calving interval reduce yearly production cycle and the amount of milk a cow likely to produce in given period of time, which might be associated with environmental factors, poor nutrition, poor housing, lack of sufficient bull and AI services and poor health and reproductive management [28]. Therefore, the calving interval should be shortened for improved reproductive and productive performances [29-31].

Conclusion

The study showed that there were significant variation in daily milk yield and lactation length performances of these cattle (local) due to agro-ecology effect in the study area; the values were significantly higher in mid land than low land. However, values of age at first calving and calving interval cows were not found significant different between agro-ecologies (midland and lowland areas).

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