Assessment of Productive and Reproductive Performance of Dairy Cows in Gindeberet and Abuna Gindeberet Districts of West Shoa Zone, Oromia Regional State, Ethiopia

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Abstract

The study was conducted in Gindeberet and Abuna Gindeberet districts of West Shoa Zone, Oromia Regional State, Ethiopia. The objective of this study was to assess the productive and reproductive performance of dairy cows in the study areas. The study districts were stratified in to two agro-ecological zones (midland and lowland). Eight kebeles were purposively selected (four kebeles from each agro-ecological zone) based on dairy potential and accessibilities. A total of 240 households were selected by proportional random sampling technique. Data were collected by formal interview method by using semi-structured questionnaire. The result of the study indicated that the overall average milk yield per cow per day in the study areas were 1.42±0.15 and 4.5±0.12 liters for both local and cross cows, respectively. The overall average lactation length per cow in the study areas were 7.58±0.06 and 9.05±0.14 months for both local and cross cows, respectively. The overall average age at first service, age at first calving, calving interval and days open for local bred cows were 45.27± 0.47, 57.08 ± 0.61 and 20.93±0.22 months and 191.40 ± 0.35 days, respectively. The overall average age at first service, age at first calving, calving interval and days open for cross bred cows were 32.11± 1.23, 40.79 ± 1.23 and 17.69±1.23 months and 113.08± 0.31days, respectively. The current constraints of dairy production in the study areas were lack of breed selection, shortage of feed and feeding, lack of health care and extension services. Therefore, from the current study it was concluded that the reproductive and productive performance of both local and crossbred cows are relatively low. Hence, there should be need extension services to improve the productive and reproductive of dairy cattle to enhance the improvement of livelihood of the small holders in the study areas.

Keywords: - Abuna Gindeberet, Cross bred, Gindeberet, lactation length, Local bred, Milk yield

INTRODUCTION

 Ethiopia is one of the tropical and subtropical country in Sub-Saharan Africa, has about 53.9 million cattle, 25.4 million sheep, 24.06 million goats and 0.9 million camels, excluding livestock population of three zones of Afar and six zones of Somali regions (CSA, 2013). Naturally endowed with different agro-ecological zones and suitable environmental conditions, Ethiopia is a home for many livestock species and suitable for livestock production. The country is believed to have the largest livestock population in Africa and tenth in the world. From the total cattle population 98.95% are local breeds and the remaining is up grade and crossbreds (CSA, 2013). Oromia region contributes more than 35% cattle and 32% sheep and goats to the national livestock population. The subsector contributes about 16.5% of the national Gross Domestic Product (GDP) and 35.6% of the agricultural GDP. It also contributes 15% of export earnings and 30% of agricultural employment (Behnke, 2010). Regarding dairy production, the national milk production remains among the lowest in the world, even by African standards (Zegeye, 2003). Despite the huge livestock population of the country the current milk production per annum is very low which has been estimated to be 3.2 million ton and growing at a rate of only 1.2% for indigenous and 3.5% for improved stock per year (Tsehay, 2002).

Dairy production, among the sector of livestock production systems, is a critical issue in Ethiopia where livestock and its products are important sources of food and income. However, dairying has not been fully exploited and promoted in the country (Sintayehu *et al*., 2008). Taking into consideration the human population growth rate of about 2.9% per annum and the likely increase in demand for dairy products especially in the urban areas, milk production is expected to grow in Ethiopia at a rate of 3.8-4% annually until 2020 (Holloway *et al*., 2000). Lower milk production performance is attributed to reduced lactation length, extended calving interval, late age at first calving, poor genetic makeup (Yoseph *et al*., 2003) and shortage of livestock feeds both in quantity and quality, especially during dry season (Ahmed *et al*., 2010). Reproductive performance is often a major determinant of biological and economic efficiency of livestock production in tropics. Among reproductive performance traits: age at first service, number of service per-conception, calving interval, age at first calving, days open, service per conception, gestation length, calving rate, non returning and returning rate of service are

the bases of profitable production for dairy farm (Mukassa-Mugrewa, 1989). Calving interval is probably the best indicator of a cow's reproductive efficiency and ranges from 12.2 to 26.6 months for local cattle (Mukassa-Mugrewa *et al*., 1989). According to Belay *et al*. (2012) calving interval 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.

Even though it has been said that Gindeberet and Abuna Gindeberet districts are endowed with livestock resources and has huge potential for cattle production, however there is no tangible information about the cattle production and reproductive performance of the areas. The areas were the most neglected ones in terms of livestock development. The current survey was carried out to bridged information gap on the production and reproductive performance, challenges and opportunities available along with appropriate suggestions for the improvement of cattle production in the areas.

MATERIALS AND METHODS
Description of the Study Areas
The study was conducted in Gindeberet and Abuna Gindeberet districts of West Shoa Zone, Oromia Regional State, Ethiopia

Gindeberet district: It is located at about 180km West of Addis Ababa and 138 km from Zonal town (Ambo). Agro-ecologically, it is characterized as midland (43%) and lowland (57%). Its rainfall is ranging from 800-1400mm; the temperature is from 12-25°C and its altitude is1800-3200 m.a.s.l.

According to the district of livestock development and health office annual report of the study area (2014), the total area of land in the area is 119,879 hectare. 65,491 hectar is cropland, 32,510 hectare is grazing land and the remaining are forest, bush and shrub. Livestock populations found in the district are 199116 cattle, 35989 sheep, 36993 goats, 9143 horses, 10427 donkeys, 770 mules 71598 chicken and 21174 honeybee colonies

Abuna Gindeberet is located at about 170 km from West of Addis Ababa and 128 km from Zonal town (Ambo). Agro-ecologically it is characterized as midland (32%) and lowland (68%). The annual rainfall is ranging from 800-1400 mm. Temperature of the district is 10-30°c and its altitude is 1000-2604 m.a.s.l.

According to the district of livestock development and health office annual report of the study area (2014); the total area of land in the area is 135,557 hectare. 74,798 hectare is cropland, 35,670 hectare is grazing land and the left are forest, bush and shrubs. Livestock populations found in the district are 161817 cattle, 34121 sheep, 39872 goats, 5543 horses, 11994 donkeys, 962 mules, 68483 chicken and 16686 honeybee colonies.
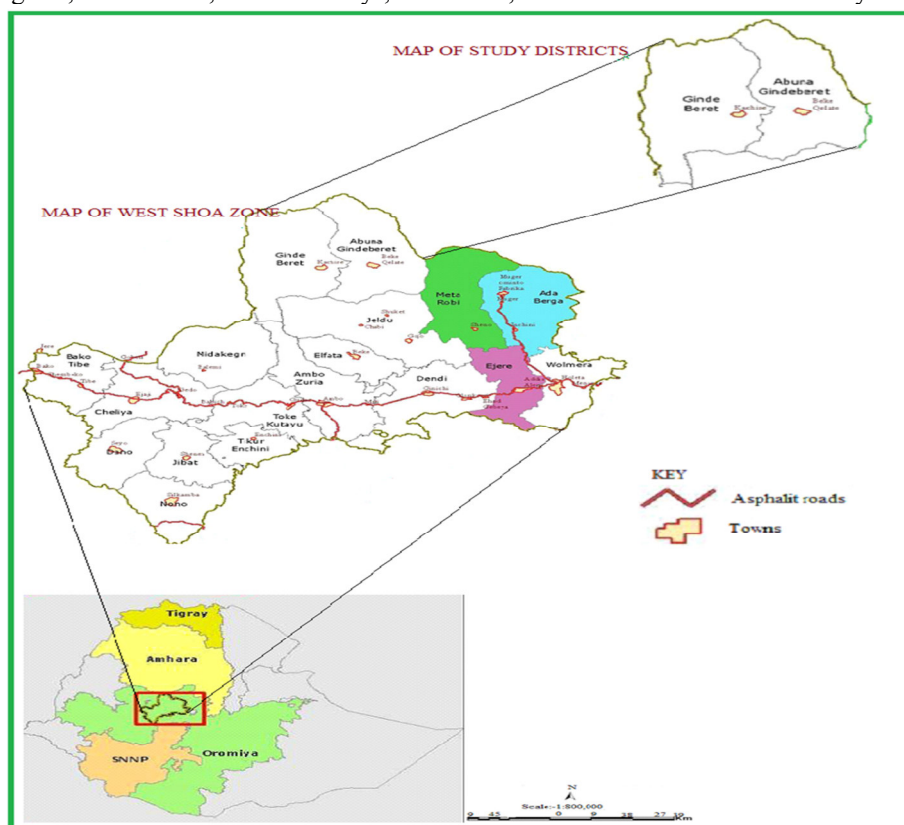

Figure 1: Map of the Study districts (LIVES, 2012)

Sampling Techniques and Household Selection

The study districts were stratified into two agro-ecological zones; namely midland and lowland. From each agro-ecological zone, four peasant associations (PA) were selected based on accessibility and dairy production potential. A total of 240 households were randomly selected based on proportions of PAs in each district and proportions of households in each PAs. Accordingly, 52 and 68 households from lowland and midland of Gindeberet and 54 and 66 households from lowland and midland of Abuna Gindeberet were selected.

Sources and Methods of Data Collection

The study was based on both secondary and primary sources of data. The primary data were collected from 240 respondents by formal interview method using semi-structured questionnaires. Secondary data were obtained from livestock resource, production and health office and Agricultural and rural development office of Gindeberet and Abuna Gindeberet districts.

Data Analysis

The collected data were analyzed by using statistical package for social science (SPSS ver. 20) software and Microsoft office Excel 2007. The results were summarized by using percentages, means, charts and Standard error.

RESULT AND DISCUSSIONS

Land holding Characteristics

The land holding status of the sample households in the study areas were presented in (Table 1). The overall average land holding size per household in the current study (3.21±0.14 hectare) was higher than the national average land size (0.96 hectare) and that of Oromia regional state (1.15 hectare) per household (CSA, 2011). It was also apparent from the study that the land holding size of the households' (3.66±0.22 hectare) in Gindeberet district is greater than Abuna Gindeberet district (2.76±0.14 hectare) per household.

Table 1: Average land holding and land use pattern

	Study districts		
Land Category	Gindeberet	Abuna Gindeberet	Overall
	Mean ± SE	Mean±SE	Mean±SE
Crop land (ha)	3.10±0.16	2.24±0.10	2.67±0.10
Grazing land (ha)	0.34±0.03	0.30±0.02	0.32±0.02
Vegetable and Fruit (ha)	0.13±0.02	0.14±0.01	0.13±0.01
Tree Plantation (ha)	0.09±0.01	0.08±0.01	0.09±0.01
Total land owned	3.66±0.22	2.76±0.14	3.21±0.14

ha = hectare, SE = Standard error

Livestock size per Households

The livestock species per household presented in (Table 2). Cattle are the dominant livestock in the study areas. This is because of the fact that the crucial roles of cattle has in the socio-economic set up of the farming community where 100% of draught power sources for crop production is contributed by cattle.

The overall average cattle size per household in the study areas were 14.08 head (ranges 2-55 head). Cattle are actually reared for multifaceted purpose in the study areas. In addition to purposes of draught power to smallholder, they are being used as a store of value, measure of wealth, and source of income, fuel, food and manure. In addition to Cattle, Sheep, Goat, donkey, horse, Mule and Chicken were the other important livestock species raised by large proportion of households in the areas.

Table 2: Livestock holding per households in the study areas

	Study districts				Overall	
Livestock type	GB		AGB			
	% HH	Mean	% HH	Mean	% HH	Mean
Cattle	100	16.42	100	11.74	100	14.08
Chicken	72.5	8.23	64.17	6.37	68.3	7.30
Sheep	52.5	3.50	63.33	5.13	57.9	4.32
Goat	35.0	2.33	32.5	2.08	33.8	2.21
Donkey	70.8	1.22	58.33	0.83	64.6	1.03
Horse	25.8	0.47	31.17	0.53	28.5	0.50
Mule	3.3	0.03	4.17	0.04	3.7	0.04
Honeybee (colony)	63.3	7.23	70.83	6.93	67.1	7.08

GB = Gindeberet, ABG =Abuna Gindeberet, HH = household

Lactation length and Average Milk yield of Dairy Cows

Lactation length

The overall average lactation lengths for local and crossbred cows were 7.58 ± 0.06 and 9.05±0.14 months,

respectively (Table 3). Kedija *et al*. (2008) and Adebebay (2009) also reported almost similar results (7 months for local cow and 9 months for cross cow) at *Meiso* and *Bure* districts, respectively. However, the lactation length for local cows observed in the current result was almost similar with the national average lactation length (7 months) (CSA, 2005), whereas the overall mean lactation length in crossbred cows observed in the current study was shorter than the lactation length (11.7 months) reported for crossbred cows in the central highland of Ethiopia (Zelalem and Ledin, 2001). This variation might be associated with different husbandry practices in terms of poor nutrition and other managements in the study areas and breed type may be used.

Milk yield
The overall average milk yield per cow per day for local and crossbred cows were 1.42±0.15 and 4.50±0.12, respectively (Table 3). The study revealed that the average milk yield of local cows in Gindeberet and Abuna Gindeberet districts were not significantly different. It was estimated from the result, local cows at both districts might be kept under similar management, (housing and feeding practices) which may revealed in similar performance. The overall average milk yield per day per cow for local and crossbred cows in the study districts were lower than the overall average milk yield per cow per day 1.82 and 8 liters for local and crossbred cows reported by Adebebay (2009) in West *Gojam* Zone, *Bure* district, respectively. However, the current finding was lower than Belay *et al*. (2012) who reported 1.76±0.89 liters for local cows in West Shoa Zone, *Dandi* district. The current result was similar with Kedija *et al*. (2008) who reported 1.24 liters per cow per day for local cows in *Meiso* district. Generally, the overall average of milk yield per cow per day for local cow in the study areas were in the range of average national milk standard 1.3-1.54 liters for local cows (Land O'Lakes, 2010). However, in case of crossbred cows it has been great differences when compared with the results of different authors. This might be associated with different husbandry practices in terms of poor nutrition and management in the study areas.

Table 3: Lactation length and Milk yield for both local and cross bred cows in the study areas

	Study districts					
	Gindeberet		Abuna Gindeberet		Overall	
	N	Mean(SE)	N	Mean(SE)	n	Mean(SE)
Lactation length of local cows (months)	120	7.51±0.07	120	7.66±0.07	240	7.58±0.06
Lactation length of crossbred cows (months)	14	9.0±0.15	5	9.20±0.37	19	9.05±0.14
Average milk yield/day/cow for local(liter)	120	1.44±0.24	120	1.41±0.17	240	1.42±0.15
Average milk yield/day/cow for cross(liter)	14	4.39±0.13	5	4.80±0.25	19	4.50±0.12

n=number of respondents; SE=Standard error

Reproductive Performance of Dairy Cows
Age at First Service
The overall average age at first service (AFS) for local and crossbred heifers in the study districts were 45.27 ± 0.47 and 32.11 ± 1.23 months, respectively (Table 4). The current result reported for local cow was agreement with the report of Gidey (2001) who reported 44.0 ± 8.0 months for Fogera heifers at Andassa Livestock Research Centre.

The current finding for local heifer was in the range of (28 ± 2 to 47 ± 2 months) who reported by Ulfina *et al*. (2004) for Horro heifers under different feeding regimes. The current result for cross bred is higher than the finding of Belay *et al*. (2012) who reported an average AFS of 24.3±8.01 months at *Jimma* town Oromia regional state. But Nibret (2012) reported age at first service for cross bred (15.5 months) than the present value at *Gondar*, Amahara regional state. This difference might be associated with low management in terms of feed and feeding, health care and no extension services in the study areas.

Age at First Calving
The overall average of age at first calving (AFC) for local and crossbred cows in the study areas were 57.08 ± 0.61 and 40.79 ± 1.23 months, respectively (Table 4). The result of this study for local cow was higher than the value (50.59 ± 6.94) reported by Belay *et al*. (2012) in *Dandi* district of West Shoa Zone and the value (53.52 ± 7.68 months) reported by Adebebay (2009) in *Bure* district of Amahara region. The average AFC obtained for local heifer in the present result was agreement with Ulfina *et al*. (2004) who reported a range of 40 ± 2 to 59 ± 2 months of AFC for heifers of *Horro* breed maintained under different feeding management at *Bako* Agricultural research center. However, the average age at first calving reported in the study areas for local breed were higher than 54.6 months reported by Gidey (2001) for indigenous Fogera heifers. The longer age at first calving in the study districts might be due to feed shortage and management status of dairy cows in the areas.

Calving Interval
The overall caving interval (CI) for both local and crossbred cows in the study districts were 20.93 ± 0.22 and

17.69 ± 1.23 months, respectively (Table 4). The current finding was lower than the finding of Belay *et al*. (2012) who reported 22.19 ± 7.73 months for calving interval of local cows at *Dandi* district of West Shoa Zone.

The result from the study areas for local bred were less than that of Mulugeta and Belayneh (2013) who reported 24.94 months for indigenous breed in North Shoa Zone of Oromia regional state. Similarly, the reported average calving interval for local breed in the study areas were, shorter than (25 months) reported by Mukassa-Mugrewa *et al*. (1989) in Zebu cattle but longer than the value (14.63 months) reported for Boran breed (Million and Tadelle, 2003). The average calving interval reported from the study areas for crossbred cows were less than Bekele *et al*. (1991) who reported average CI of 15.83 months for small holder cross bred dairy cows in the central highland of Ethiopia. Short calving interval in the study areas might be an indication of better management practices regarding with nutrition in terms of quality and quantity and better heat detection, *etc*.

Days Open

The overall average days open (DO) for local and crossbred heifers were 191.40 ± 0.35 and 113.08± 0.31 days, respectively. The current result of DO for local cow is lower than 340.3 days for Boran cows at *Tatessa* cattle breeding center reported by (Yifat *et al*., 2012). From the result of the study it was observed that the average days open for cross bred in the study areas were, higher than the average of 155.7 days (Belay *et al*., 2012) at *Jimma* town Oromia Regional state. Similarly, the current finding of DO is longer than the result of (Nibret, 2012) who reported 87 days for cross bred cows at *Gondar* North Western Ethiopia. This variation might be attributed to lack of proper management and problem of proper heat detection in the study areas.

Table 4: Reproductive performance of dairy cattle in the study districts

	Study districts					
	Gindeberet		Abuna Gindeberet		Overall	
Bred	N	Mean (SE)	N	Mean (SE)	N	Mean (SE)
Local						
Age at first service (month)	120	45.70±0.68	120	44.85±0.66	240	45.27±0.47
Age at first calving (month)	120	56.05±0.76	120	58.10±0.94	240	57.08±0.61
Calving interval (month)	120	21.42±0.30	120	20.45±0.32	240	20.93 ± 0.22
Days open (day)	120	185.50±0.10	120	197.30±0.60	240	191.40 ± 0.35
Cross						
Age at first Service (month)	14	32.29±1.29	5	31.60±3.29	19	32.11±1.23
Age at first calving (month)	14	40.86±1.26	5	40.60±3.29	19	40.79±1.23
Calving interval (month)	14	17.57±0.99	5	18.00±1.89	19	17.69±0.86
Days open (day)	14	109.11±0.29	5	117.05±0.33	19	113.08± 0.31

n=number of households; SE=Standard error; N= Overall households

CONCLUSION

Problems of insufficient AI service and planned breed upgrading system, scarce of veterinary service and inadequate extension services were some of the identified determinants for the improvement of dairy cattle in the areas. Based on the results of the study the productive and reproductive performance of both local and cross breeds were relatively low. The study showed that only the rural small-scale mixed crop-livestock production system is the wide spread dairy production and peri-urban production system is identified in few cases. There are huge cattle genetic resources in the study areas but almost all the cattle kept by the farmers are non-descriptive indigenous types. Therefore, future research and development activities should have to curtail the bottlenecks so that the vast potential of the districts could be exploited to its maximum and improve the livelihood of the community.

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