Characterization of Overall Reproductive and 
Lactation Performance of Dairy Cows in Delgi Town and Kebeles 
at Takusa Woreda of North Gondar Zone of Amhara Regional, Ethiopia

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Abstract: This study was conducted in the Delgi ketema and nearby kebeles at Takusa woreda of north Gondar zone of Amhara regional state from January 2014 – April 2014 with the objectives of to characterize overall reproductive and lactation performances of dairy cows of Delgi ketema and nearby kebeles and to estimate, age at first calving, calving intervals, lactation yield, daily milk yield, lactation length and reproductive efficiency of local and crossbred dairy cows. The Participatory Rural Appraisal method was used to generate information during exploratory survey. After taking inventory of all dairying activities, by using random and purposive sampling technique, 100 households was selected for formal survey (multipurpose single survey method) and the selected members were interviewed using standardized questioner. The overall average age at first calving of local and crossbred dairy cows was 45.6 months of which made up 48 months (n=72) for local cows and 43.2 months (n=28) for crossbred dairy cows. The overall average calving interval of both local and crossbred dairy cows was 14.2 months of which made up 15.8 months (n=72) for local dairy cows and 12.58 months(n=28) for crossbred cows. The overall average milk yield per lactation in the Delgi area was 817.2 liters per lactation of which made up 383.01 liters per lactation (n=72) and 1251.1 liters per lactation(n=28) for local and crossbred respectively. In the Delgi ketema and nearby kebeles, considering average lactation length and average lactation yield of local cows, the average estimated daily yield off take from local cows was 1.42 liters per day(n=72). The average estimated daily milk yield of crossbred cows was 2.96 litres per day ((n=28) and lactation length of (n=72) 8.45 months and (n=28) 14.03 months for local and crossbred dairy cows respectively. In conclusion, in the study area intervention measures has to be taken to fill the gaps from the expected to be achieved.

Key words: Lactation Performance • Local Crossbred Cows and Reproductive Performance

INTRODUCTION

Ethiopian is one of the least developed counties in the world with per capital income of 130 USA Dollar [1]. Poverty and food insecurity are the two major problems in the country. As many in developing countries, agriculture is the mainstay of the Ethiopians and about 85 percent of the total population is engaged in the sector. The contribution of the sector to the country’s domestic product (GDP) and export are about 60% and 90% respectively [2]. Animal production plays a significant role in the country’s economy. The livestock subsectors contribute approximately 12-15% to the GDP [3]. Ethiopia has diverse animal genetic resources and its relatively large livestock population (approximately 100 million) is well adapted to and distributed among diverse ecological condition and management systems. The major farm animal’s genetic resources of the country include cattle, sheep, goats, donkeys, horses, mules, camels and chickens [4]. The estimated numbers of indigenous milk cows in Ethiopia is about nine million and in the hands of smallholder farmers under traditional production system. The total milk production per year from cattle is 0.8 million out of 1.0 million tons from all the species put together in Ethiopia [5]. The overall milk yield per lactation in the Yerer watershed area was 506.78 liters made up of
238.35 liters for Zebu/local/ and 1558.12 (n=72) litres for crossbred/ crosses between local Holstein Friesian [6]. According to Fikre Lobago [4] cross breeding of improved exotic dairy cattle breeds on a wide scale was introduced 5 decades back to upgrade the genetic potential of the indigenous zebu cattle and subsequently to improve the dairy sector in Ethiopia. Since then, various effort have been made to improve the dairy sector through Artificial insemination or shared crossbred bull service or by distributing crossbred F1 heifers particularly to the small holder dairy farm in urban and peri-urban areas and to those rural farmers located in close proximity to urban areas [4]. Reproductive performance is one of the major factors, other than milk production, that affect productivity of the dairy herd. Reproductive performance is biologically crucial phenomenon’s, which determine the efficiency of animal production [6]. Given the current number of milk cows and lactation yield, the projected demand-supply variance for milk in the urban sector is about 2.74 billion liters per annum. In order to fulfill the increasing demand at least a consistent 4% annual increase in milk production will be required [5]. Hence, the objective of this study was to characterize the overall reproductive and lactation performances of dairy cows i.e. at first calving, age at first breeding, calving interval, lactation length, lactation yield, daily milk yield and reproductive efficiency of dairy cows in the study area.

**MATERIALS AND METHODS**

**Study Area:** The study was undertaken in Dalgi town and nearby kebeles at Takusa woreda the north Gondar Zone of Amhara region, Ethiopia.

**Location and Climate of the Area:** Based on Takusa woreda Agricultural office 2003 unofficial and unpublished report, Delgi town of Takusa woreda located 93kms from Gondar town and 93kms from University of Gondar. The town has the following Delgi, Mekonta and Chemera kebeles. The town is all in all waynadega with the average temperature of minimum 18 and maximum of 25°C and has a human population size of 29957 (9931 male and 20026 female). In the town kebeles own dairy cows are 575, 2302 and 1088 in Delgi, Mekonta and Chemera respectively. There are 38 crossbred dairy cows in the town, of which 1300 households owning milking dairy cows at present. The total number of households in the town is 7015 (2372, 1385 and 3258 in Delgi, Mekonta and Chemera respectively). The current price of milk in the town is varying from 9 – 6 birr/l, butter from 125 – 80 birr/kg and no cheese purchasing habit. The report added that the majority of the feeding system in the town is predominantly grazing but also other supplementary by products. The report also has indicated that, other than dairy cows in the town currently which is owned by the households 6432, 2259, 2972, 1897, 4567, 11350, 45 and 1337, local number of bull, heifers, calf, goat, sheep, poultry, mule and donkey, respectively. In addition they have 153 numbers of crossbred cattle, of which 38, 16, 49 and 50 number of cows, bulls, heifers and calf respectively.

**Data Required:** Both qualitative and quantitative data that required for the study was generated using exploratory and diagnostic survey. The data was generated by exploratory survey and secondary information include, attempt has made to identify; major farms and farm activities, current practices, perception of the system in which the farmers operator and also to identify exogenous factors (which influence production pattern and the link between them), endogenous factors (which influence production decision at the house hold level and the manner in which each affect the other).

**Sampling Procedure:** By defining the boundary of a dairy shed, based on the information collected during the informal diagnostic survey, the geographical distribution of these sampling units within the dairy shed was established. Resource constraints was decided, although sample size was sufficiently large to permit statistical analysis, financial, human resource and time constraints was taken into account prior to sample selection survey execution. When prior knowledge of the size of the target population is poor, a random sample selection with a given sampling intensity may be difficult to obtain. It may then be preferable to purposively i.e. sample using a subset of the population but whose characteristics are known and meet desired criteria [7]. Field instrument: dairy shed level as a preliminary step of collecting information on the production to consumption system, secondary sources was reviewed and discussion had held with knowledgeable key informants. At household level it is anticipated that much of information required for characterization of the production to consumption system was gathered primary data collection at the house hold level. The methodology proposed was multipurpose single survey method a formal survey of a representative sample of dairy production units within the dairy shed. The sample size proposed is in the range 100 to 150 units [8]. A Farmer recall (over one year) technique was used for collecting production data.
Considering the cost, time and resources limitations, a total of 100 households is considered adequate from three Kebeles (area); Delgi, Makonta and Chamera for the formal survey interview. List of male and female households obtained from each PA’s official was used for random selection of the household for the formal interview. Random table was used for household selection. Hence, stratified proportionate random sampling or purposive sampling techniques were used for the study.

Data Collection: Both exploratory and diagnostic surveys were used to generate qualitative and qualitative data for the study. To have an overall view of the farming system, an exploratory survey was carried out using checklists to discuss with farmers. The participatory rural appraisal (PRA) was used to generate information during exploratory survey. More over a rapid survey technique with key informant interview method was used. Based on the information generated through PRA, the questionnaire [7, 8] was used and recorded sheets were developed for the formal interview/diagnostic survey. Before starting the dual formal survey developed questioner was pre-tested for the suitability of the study. Field observation was taken of respondents farmers in the sampling area. Details on animals were gathered from owner’s interview.

Statistical Methods: The statistical analysis used in the study would vary depending on the type of variables and information obtained. However, the quantitative data was analyzed using descriptive statistics (percentage, mean/average, comparison, etc.). Computer software such as excel was used for data management and analysis. The analyzed data was presented by table and chart.

RESULT AND DISCUSSION

Reproductive Performance

Age at First Breeding (AFB): Age at first breeding/service is the time at which heifers to be bred for the first time as it reached the age of puberty. The overall average age at first breeding/service revealed on this study was found to be 36.6 months of which 39 months (n=72) for local dairy cows and the age at first service for crossbred dairy cows was 34.2 months (n=28). The result of age at first breeding/service obtained in the study area was higher than the result of study conducted in Jimma town 24.3 months according to Belay Duguma et al. [9]. Table 1. Shows the overall average reproductive and lactation performance of local and crossbred dairy cows in study area.

Age at First Calving (AFC): The beginning of the productive life of the heifer is called age at first calving [6]. As it was indicated in Table 1 the overall estimated average age at first calving at the study area was found to be 45.6 months of which 48 months (n=72) for local cows and 43.2 months (n=28) for crossbred dairy cows. The age at first calving of local cow, in study area was almost similar to study on boran type cattle which is 45.5 months according to Mekonnen Haile-Mariam and IAR. [10,11]. It is better for local cows of study area, when compared to study undertaken in Chacha town is 47.16 months as reported by Mulugeta Ayalew and Belayeneh Asefa [12]; 58.8 months in Andasa ranch Fogera heifers by Asheber Sewalem. [13] and 58.09 months in Yerer watershed by Mulugeta Ayalew [6]. But the age at first calving of crossbred cows in study area was higher than the result reported from Chacha town which is 37. 95 months particularly for cross bred cows was strictly similar to the optimum calving intervals to be accepted (12 to 13 months). Figure 2. Shows the overall average reproductive performance of local and crossbred dairy cows in study area.

Calving Interval (CI): Calving interval refers to the period between two consecutive calving and is the function of day open and gestation length. Calving interval is reported to have low heritability and can be improved through better nutrition and early breeding [14].

The overall estimated average calving interval of local and cross bred cows was found to be 14.2 months of which for local cows was 15.8 months (n=72) and 12.58 months (n=28) for crossbred dairy cows. The calving interval of the study area was better than study conducted in Ginch which is 666 days as report of Getachew Eshete [15]. The calving interval of study area was close similar to the study undertaken in Selale areas which is 15.4 and 14.3 months according to [16] and [17] respectively. The calving interval of study area particularly for cross bred cows was strictly similar to the optimum calving intervals to be accepted (12 to 13 months). Figure 2. Shows the overall average reproductive performance of local and crossbred dairy cows in study area.
Table 1: Overall average reproductive and lactation performance of local and crossbred dairy cows in study area with n=72 and n=28 respectively

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Local cows (n=72)</th>
<th>Crossbred cows (n=28)</th>
<th>Overall average (n=100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFB (in months)</td>
<td>39</td>
<td>43.2</td>
<td>36.2</td>
</tr>
<tr>
<td>AFC (in months)</td>
<td>48</td>
<td>43.2</td>
<td>45.6</td>
</tr>
<tr>
<td>CI (in months)</td>
<td>15.8</td>
<td>12.58</td>
<td>14.2</td>
</tr>
<tr>
<td>LL (in months)</td>
<td>8.45</td>
<td>14.03</td>
<td>11.24</td>
</tr>
<tr>
<td>LY (l/lact.)</td>
<td>383</td>
<td>1251.14</td>
<td>817.07</td>
</tr>
<tr>
<td>DMY (in l/lac.)</td>
<td>1.47</td>
<td>2.96</td>
<td>1.52</td>
</tr>
<tr>
<td>RE (%)</td>
<td>61.5</td>
<td>67</td>
<td>63</td>
</tr>
</tbody>
</table>

Table 2: The overall average reproductive performances of local and crossbred dairy cows in the study area

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Kebeles</th>
<th>Sample size (n)</th>
<th>AFB (in months)</th>
<th>AFC (in months)</th>
<th>CI in months</th>
<th>RE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Delgi</td>
<td>40</td>
<td>36.6</td>
<td>45.6</td>
<td>13.15</td>
<td>67.5</td>
</tr>
<tr>
<td></td>
<td>Chamera</td>
<td>30</td>
<td>36.6</td>
<td>45.6</td>
<td>13.8</td>
<td>55.9</td>
</tr>
<tr>
<td></td>
<td>Makonta</td>
<td>30</td>
<td>36.6</td>
<td>45.6</td>
<td>16.02</td>
<td>65.25</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>100</td>
<td>109.8</td>
<td>136.8</td>
<td>43.03</td>
<td>188.65</td>
</tr>
<tr>
<td>Overall average</td>
<td></td>
<td></td>
<td>36.6</td>
<td>45.6</td>
<td>14.34</td>
<td>63</td>
</tr>
</tbody>
</table>

Table 3: Lactation performance of local and crossbred cows

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Kebeles</th>
<th>Sample size (n)</th>
<th>LL (in days)</th>
<th>LY (in l/lact.)</th>
<th>DMY (in l/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Delgi</td>
<td>40</td>
<td>350</td>
<td>397.8</td>
<td>1.3</td>
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<tr>
<td></td>
<td>Chamera</td>
<td>30</td>
<td>268</td>
<td>426.4</td>
<td>1.58</td>
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<td></td>
<td>Makonta</td>
<td>30</td>
<td>235.8</td>
<td>396.7</td>
<td>1.68</td>
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<tr>
<td></td>
<td>Sb-total</td>
<td>100</td>
<td>853.8</td>
<td>1220.9</td>
<td>4.56</td>
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<tr>
<td>Average</td>
<td></td>
<td>33.3</td>
<td>262.6</td>
<td>383</td>
<td>1.4</td>
</tr>
</tbody>
</table>

Table 4: Average lactation performance of local and crossbred cows in study area

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Kebeles</th>
<th>Sample size (n)</th>
<th>DMY (in days)</th>
<th>LY (in litres)</th>
<th>LL (in days)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Delgi</td>
<td>40</td>
<td>2.27</td>
<td>923.9</td>
<td>407.2</td>
</tr>
<tr>
<td></td>
<td>Chamera</td>
<td>30</td>
<td>1.2</td>
<td>802.48</td>
<td>337.2</td>
</tr>
<tr>
<td></td>
<td>Makonta</td>
<td>30</td>
<td>1.4</td>
<td>760.75</td>
<td>314.1</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100</td>
<td>4.87</td>
<td>2487.13</td>
<td>1058.5</td>
</tr>
<tr>
<td>Overall average</td>
<td></td>
<td></td>
<td>1.6</td>
<td>829.04</td>
<td>352.8</td>
</tr>
</tbody>
</table>

**Lactation Performance**

**Lactation Yield (LY):** The first and most important purpose of dairy cattle production is to provide milk for family use and for sale [6]. The overall average estimated lactation yield of local and crossbreds was found to be 817.07 liters of which 383.01 liters (n=71) were for local cows and the average lactation yield of crossbreds in study area was 1251.14 liters per lactation (n=29). The milk yield of dairy cows in study area is undoubtedly very low compared to study conducted in Chacha town which is 457.8 liters for local cows and 1511.5 liters for crossbreds as reported by Mulugeta Ayalew and Belayneh Assefa [12], Jimma town 2333.6 liters [9]; Boran 454.18 litres [18]. However, this result was better than Yerer watershed for local cows according to report of Mulugeta Ayalew [6] which was 238 liters per lactation which may be due to good management practice available in Delgi town and nearby kebeles than Yerer watershed for dairy cows production. This result for crossbreds cows of the study area is almost similar to study reported on Gashaw Geda [16] that mean annual milk yield of crossbreds in Selale was 1291.8 liters. The estimated milk yield per lactation was vary according to Teferi Dina [19] who reported that ¾ Friesian crosses with Arsi give 1540 liters
per lactation yield. Keberu Belayneh [20] an overall mean annual milk yield of 1581 kg for crossbred cows kept in Agarfa. Gryseels and Anderson [21] in their study using 40 small holder farms obtained an average milk yield of around 1800 liters per cows per year at Debre zeit and 1000 liters per cow per year at Debre berhan. Table 3 and Figure 4 show lactation performance of local and crossbred cows in study area.

**Lactation Length (LL):** The overall lactation length of both local cows and crossbred cows in the Delgi town and nearby kebeles was 11.24 months as farmer’s statements. The estimated average lactation length for local cows was 8.45 months (n=72) and the average lactation length of cross bred dairy cow in Delgi town and nearby kebeles was 14.03 months (n=28), (Refer Table 1). This result is higher than lactation length of dairy cows reported as [11] which is 8.03 months and 4.63-10.43 months reported for Boran cows by Wahid [18]. Schaar *et al.* [22] calculated lactation length of 148, 227 and 237 days for 1st, 2nd and 3rd lactation for Arsi zebu and 175, 172 and 185 days for first lactation of Fogera, Boran and Barka breeds respectively in Ethiopia. The obtained result in study areas relatively similar to the lactation length of study conducted in Jimma town which is 9.13 months according to [9]; and North West and central Ethiopia 10.1 months [23], 10.1 months [24] and 11.1 months [25].
Daily Milk Yield (DMY): In the Delgi town and nearby kebeles at Takusa wored, considering average lactation yield and lactation length of both local cows and crossbred dairy cows (Figure 5), the overall average estimated daily milk off-take from both local and crossbred cows was found to be 1.52 liters per day per cow. Were the resulted average daily milk yield of local cows was 1.47 liters per day per cow (n=70) and 2.96 litres per day per cow for crossbred dairy cows (n=30). This result is better when compared to report by Degena Aredo and Adugna Lemi [26] who reported national average of 1.09 liters per day per cow. In another way, the estimated daily milk yield of local cows in agreement with Yitaye Alemayehu [27] who reported amount of 1.5 liters ranging from of 0.5 to 2 liters of daily milk yield for local cows and 1.5 to 2 liters over a 150-180 days lactation period for Ethiopian local cows according to FAO. [28]. As conclude, from this result crossbred dairy cows were better than local cows in terms of daily milk yield. In contrast, the daily milk yield of crossbred cows of study area was lower than study
undertaken in Yerer watershed 5.97 litres per day per cow according to Mulugeta Ayalew [6]. The difference may be due to exotic blood, available feed, environmental and management conditions.

**Reproductive Efficiency (RE):** The parameters which measure reproductive efficiency could be calculated as the information gathered from the owner’s, based on, the number of calves born, age of cow in month and age at first breeding in month of dairy cows.

\[
RE = \frac{(12 \times \text{no. of calves born})}{(\text{Age of cow in month} - \text{age at first breeding in month}) + 3} \times 100
\]

Then, the overall reproductive efficiency of local and crossbred cows in study area was calculated to be 63% of which 61.5 % for local cows (n=72) and 67 % for crossbred dairy cows (n=28). The reproductive efficiency of study area was similar to result reported from the study conducted in Chacha town 62% by Mulugeta Ayalew and Belayneh Asefa [12]. The reproductive efficiency as a whole shows the presence of wastage of days which could be manifested by morbidity losses [12].

**CONCLUSION AND RECOMMENDATION**

The most of the herd germplasm in the study area was local breed which is very low in reproductive and lactation performance as compared to crossbred available in the area. The overall performance of dairy cows in the study area was too low beyond the expected result. The main feeding system used in the study area was grazing on natural pasture and sometimes crop residue and others. One crossbred cow was approximately equivalent to two local cows in terms of daily milk yield. However, the overall result of reproductive and lactation performances made from the study area was very low beyond expected to achieve. This is may be due to lack of enough and quality feed, lack of credit, lack of extension service, animal cannot produce more in particularly local cows, lack of improved cows and breeding problems etc. Despite of these problems, the increase of exotic blood level would improve the performance of local cows with some extents. So, it would be better option to introduce exotic breed in to the area with appropriate management system.

In general, in order to promote the reproductive performance of dairy cows and to promote improved dairy production system in the area, integrated type of development program will be very important. By doing so, dairying is likely to become one of the main occupations of the farmers of Delgi town and nearby kebeles at Takusa woreda.

**REFERENCES**


