

## **Productive and reproductive performance of local cows under farmer's management in central Tigray, Ethiopia**

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*Target audience: Ministry of Agriculture, Researchers, Dairy Policy Makers*

### **Abstract**

*The study was conducted on 408 indigenous cows maintained under farmer's management in eight districts of central Tigray, Ethiopia. A total of 208 small-scale dairy farm owners were randomly selected and interviewed with structured questionnaire to obtain information on the productive and reproductive performance of indigenous cows. The results of the study showed that the mean age at first calving (AFC) was  $43.3 \pm 2.7$  months, number of services per conception (NSC) was  $2.7 \pm 0.5$ , days open (DO) was  $201.47 \pm 61.21$  days, calving interval (CI) was  $468.33 \pm 71.42$  days, lactation length (LL) was  $206.17 \pm 32.33$  days, lactation milk yield (LMY) was  $414.65 \pm 53.69$  litres for indigenous cows. The estimated value for productive and reproductive traits had higher than normal range in indigenous cows. This calls for a planned technical and institutional intervention for improved support services for appropriate breeding programs, improved cows and adequate veterinary health services.*

**Key words:** *Productive and Reproductive Performance, Local Cows.*

### **Description of Problem**

Ethiopian economy is primarily agrarian. Livestock sector in general and dairy farming in particular contributing considerable portion to the economy of the country. Currently, there are 28 indigenous breeds of cattle have been recognized to exist in Ethiopia (1). The total cattle population for the country is estimated to be about 59.5 million. About 98.20 percent of the total cattle in the country are local breeds. The remaining are hybrid and exotic breeds that accounted for about 1.62 percent and 0.18 percent, respectively. The estimate of total cow milk production of the country is about 3.1 billion liters (2).

Dairy sector in Ethiopia is not well organized and it is predominantly the domain of small and marginal farmers keeping 1 to 3 dairy animals under mixed farming system. The indigenous cattle are well adapted to the hot environment producing under stress of elevated temperature, high disease prevalence

and low level of nutritional status but their productive and reproductive performances are very poor. The average lactation period per cow at country level is estimated to be about six months, and average milk yield per cow per day is about 1.37 liters (2) and cows usually do not produce their first calves earlier than 35-53 months of age and calving interval is about two years (3).

To meet the ever-increasing demand for dairy products (i.e. milk and milk products), 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 many developing countries. However, information is limited about the productive performance of dairy cows in smallholder dairy farms in the tropics, particularly in Ethiopia (4). Performance record of local cows is essential for designing breeding as well as management strategies

development in dairy sector. The aim of the present study was, therefore, to investigate the productive and reproductive performance of local cows in Tigray, Ethiopia.

## **Material and Methods**

### **Study Area**

The study was conducted in and around 10 km of five weredas of Tigray region of Ethiopia namely: Enticho, Adwa, Laelay Maychew, Tahtay Maychew, Nader Adet, Wukro, Hawzen, Samre and Mekelle. Adwa has a longitude and latitude of 14°10'N 38°54'E and an elevation of 1907 meters. Enticho has a latitude and longitude of 14°16'N 39°09'E with an elevation of 1964 meters above sea level. La'ilay Maychew is bordered on the south by Naeder Adet, on the west by Tahtay Maychew, on the north by Mereb Lehe, and on the east by Adwa. Mekelle is the capital city of Tigray Region and located in the northern extremes of Ethiopia extending from 33°25'1 to 39°38'1 north latitude and from 36°27'1 to 40°18'1 east longitude at an average altitude of 2000 to 2200 meters above sea level. Wukro, Hawzen and Samre are the neighbouring districts of Mekelle (5). The climate is generally sub-tropical with an extended dry period of nine to ten months and a maximum effective rainy season of 50 to 60 days. The rainfall pattern is predominantly uni-modal (June to early September) (5).

### **Sampling procedure and data analysis**

A total of 208 smallholder dairy farmers were interviewed randomly with scheduled questionnaire which was mainly based on the productive and reproductive performance of local cows. A total of 408 local cows were included in this study were maintained under farmer's management system. The questionnaire was developed in accordance with the objectives of the study and designed in a simple manner to get accurate information

from the dairy farm owners. Each respondent was given a brief description about the nature and purpose of the study and the responses were recorded directly on the survey schedule.

The farmers under the study areas maintained cows under intensive management system in back-yard operation utilizing whatever space was available in the residential compound. The cows were managed in closed houses with different types of floor structure throughout the day. In general, the animals were fed on natural pasture (cut and carry), hay, milling by-products, concentrate mix and non-conventional feeds. Data were recorded like age at first calving (AFC), number of services per conception (NSC), days open (DO) and calving interval (CI) as measures of reproductive performance and lactation length (LL) and lactation milk yield (LMY) as productive performance. Descriptive statistics such as means and standard deviations were used (SPSS).

## **Result and Discussion**

### **Age at first calving**

The results of the study showed that the mean age at first calving (AFC) was found to be  $43.3 \pm 2.7$  months (Table-1). The mean AFC revealed in this study is shorter than the mean of  $1729.9 \pm 58.2$  days reported in Boran cows at Tatesa cattle breeding center in Gurage Zone, central Ethiopia (6);  $47.16 \pm 8.7$  months in local cows in Chacha Town and nearby selected kebeles, North Shoa Zone, Amhara Region, Ethiopia (7); 53.4 months in Fogera breed, 53 months in Horro breed and 60 months in Begait breed in Ethiopia (8). Lower mean AFC is recorded as  $39.4 \pm 1.7$  months in local cows under smallholder condition in Mekelle (9); 33.8 months reported in Arsi breed in Ethiopia (10). The AFC for local breeds being 3 years and 2 years in cross breed cattle is desirable for dairy farming. Delayed sexual maturity in dairy cows leads to economic loss due to an additional, non-

lactating, unproductive period of the cow over several months (9). Poor nutrition, reproductive management like accurate heat detection and timely insemination and other agro-ecological factors are major cause of delayed onset of puberty and subsequent fertility.

### **Number of services per conception**

The results showed that the mean age at first calving (AFC) was found to be  $2.7 \pm 0.5$  (Table-1). Lower mean AFC is reported to be

$2.1 \pm 0.1$  in local cows under smallholder condition in Mekelle, Ethiopia;  $1.6 \pm 0.6$  in Boran cows at Tatesa cattle breeding center in Gurage Zone, central Ethiopia (6);  $2.2 \pm 0.2$  in local cows of Gondar city of Ethiopia (11). NSC higher than 2 should be considered as poor (12). The differences could be attributed to differences in management practices and agro-ecology of the respective areas. Appropriate and in time heat detection and insemination could be attributed to lower or higher number of service of per conception (9).

**Table 1: Productive and reproductive performance of local cows under smallholder condition in Tigray, Ethiopia**

<b>Parameter</b>	<b>Mean±S.E</b>
<b>Age at first calving (months)</b>	43.3 ±2.7
<b>Number of services per conception</b>	2.7±0.5
<b>Days open (days)</b>	201.47±61.21
<b>Calving Interval (days)</b>	468.33±71.42
<b>Lactation length (Days)</b>	206.17±32.33
<b>Lactation milk yield (Liters)</b>	414.65±53.69

### **Days open and calving interval**

The results showed that the days open (DO) and calving interval (CI) was found to be  $201.47 \pm 61.21$  days and  $468.33 \pm 71.42$  days respectively (Table-1). DO of about 60-80 days is considered optimum (9). The averages DO and CI in this study is higher than the optimum values desirable for profitable milk production. This result of estimated DO was higher than that of  $185.82 \pm 1.23$  days in local cows under smallholder condition in Mekelle, Ethiopia; 165 days in Arsi breed in Ethiopia (10). Estimated DO in this study is lower than the mean of  $340.3 \pm 15.8$  days reported in Boran cows at Tatesa cattle breeding center in Gurage Zone, central Ethiopia (6). Feed shortage, silent estrus and lack of proper heat detection might have other contributory factors for long DO reported in this study.

The mean CI in the present study is higher than 439 days reported in Arsi breed in Ethiopia (10). Estimated CI in this study was

lower than that of 666 days in local cows in Ginch watershed in Ethiopia (13);  $24.94 \pm 4.1$  months in local cows in Chacha Town and nearby selected kebeles, North Shoa Zone, Amhara Region, Ethiopia (7); 527 days in Horro breed, 525 days in Fogera breed and 458 days in Begait breed (8);  $622.6 \pm 15.3$  days in Boran cows at Tatesa cattle breeding center in Gurage Zone, central Ethiopia (6). CI of 365 days is usually considered desirable for profitable milk production. If the calving interval is more, the total no. of carvings in her life time will be decreased and also total life production of milk decrease. Factors contributing for long CI are age of cows, breed of cows, calving season and forage availability in any particular year have to be considered as other impact factors (6).

### **Lactation Length**

The mean LL in the present study was found to be  $206.17 \pm 32.33$  days (Table-1). In

this study, the estimate of average lactation length in local cows were shorter than the standard lactation period (305 days) which might be due to poor genetic makeup of local cow. The mean LL in this study was smaller than the mean of 247.11±22.64 days in local cows under smallholder condition in Tigray, Ethiopia (9); 272 days in Arsi cows in Ethiopia (10); 234.9±6.5 days in Horro cows and 211.1±7.2 days in Boran cows in Ethiopia (14); 9.13±2.63 months in local cows in cows in Chacha Town and nearby selected kebeles, North Shoa Zone, Amhara Region, Ethiopia (7). The mean LL of this study was smaller than the mean of 184 days in Begait breed and 173 days in Horro breed in Ethiopia (8). Genetic group and parity has significant effect on LL (15).

The mean LMY in the present study was found to be 414.65±53.69 litres (Table-1) in the present study which in accordance with larger than the mean of 270 litres reported in Fogera breeds (8) and 238 litres reported in local cows in Yerer watershed Adalibeb woreda, Oromia region, Ethiopia (16). The mean LMY of this study was smaller than the mean of 464.34±41.75 litres in local cows under smallholder condition in Tigray, Ethiopia (9); 457.887± 86.4 litres reported in local cows in Chacha Town and nearby selected kebeles, North Shoa Zone, Amhara Region, Ethiopia (7); 947±42.3 litres in Boron and 1201 ±37.9 litres in Horro breeds in Ethiopia (14); 809 litres reported in Arsi breed (10); 550 litres in Horro breed and 645 litres in Begait breed (8). Variation in LMY is mainly due to genetic and various non- genetic causes. Genetic group, herd size, season of calving and parity has significant effect on LMY (15).

### **Conclusion and Applications**

Poor productive and reproductive potential of indigenous cows was observed in current study. Lactation milk yield mean LMY in the present study was found to be

414.65±53.69 litres present study which in accordance with larger than the mean of 270 litres reported in Fogera breeds.

1. Improvement and expansion of crossbred dairy cattle production at smallholder level in the study areas should be encouraged.
2. Planned technical and institutional intervention for improved support services for appropriate breeding programmes, improved cows and adequate veterinary health services is recommended.

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### **Conflict of Interests**

The authors declare that they have no conflict of interests.

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