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On-Farm Comparative Study of Productive and Reproductive Performance of Crossbred (Friesian with Local Zebu) and Local Cows in Walmera District of Oromia Regional State

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The study was conducted in Walmera district of Oromia Regional State to evaluate on-farm productive and reproductive performance of crossbred and local dairy cows. Eleven target kebeles were purposively selected (two kebeles from Holleta town and nine from rural areas) on the basis of dairy production potential and viability. The data required for the current study were collected from 102 sampled dairy producers using semi-structured questionnaire; and key informant interview, focused group discussion and personal observations were also parts of data collection methods. All the generated data were analyzed using SPSS (Version 21) and SAS. The current result showed that 2.02±0.8, 7.18±1.47 and 11.55±2.3 litters were the average daily milk produced from local, 50% Holstein Friesian (HF) and above 50% Holstein Friesian (HF) (high-grade) cows, respectively. Lactation length (LL) for local, 50% HF and high-grade dairy cows were 6.11±2.33, 8.62±1.41 and 9.31±1.2 months, respectively. The study result also revealed that 15.03±1.08, 14.84± 1.2 and 14.04±1.04`months were the calving interval and 42.23±7.4, 29.02±5.43 and 22.69±3.98 months were the age at first service (AFS), respectively for local, 50% Holstein Friesian (HF) and above 50% Holstein Friesian (HF) (high-grade) dairy cows, respectively. Age at first calving (AFC) was 51.73±6.97, 38.14±5.27 and 31.75±4.8 months for local, 50% Holstein Friesian (HF) and above 50% Holstein Friesian (HF) (high-grade) cows, respectively. It could be concluded from the present result that on-farm production and reproduction performance of all type of crossbred and local dairy cows found in the study area were relatively poor comparing the recommended standards. This might be due to poor dairy husbandry practiced by dairy producers in the study area. Therefore, the dairy sector of the study area planned technical and institutional interference on provision of advanced dairy husbandry practices to enhance productive and reproductive performance of both crossbred and local dairy cows and thereby improve the livelihood of the dairy producers in the study area.

Keywords: Crossbreed, Local, Productive and Reproductive Traits, Walmera District

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INTRODUCTION

Livestock population survey results conducted by CSA (2016/2017) estimate the total cattle population of Ethiopia to be about 59.5million, of which 98.20% of the total cattle are indigenous breeds. The remaining, 1.62 and 0.18 % are hybrid and exotic breeds, respectively. The total dairy cows are estimated to be around 7.16 million and cows in milk are about 11.83 million heads.

The large cattle population, the favorable climate for improved, different types of cattle breeds and the relatively animal disease free environment make Ethiopia to hold a substantial potential for dairy development (Zelalem, 2012). The demand for dairy product is rapidly increasing because of rapid population growth, increased per capital intake and changes in milk consumption pattern. For instance, Kefana *et al*. (2016) put national per capita milk production to over 44 liters, which is by far higher than the previous anonymous estimates.

In Ethiopia in general and in the study area in particular, crossbred cattle mainly cross of zebu with Holstein- Friesian cattle are used for milk production. Accurate evaluation of the performance of cross breeds contributes much to the development of appropriate breeding strategies. One measure of productivity is reproductive performance. Productive and reproductive performance is vital for the profitability of many animal production systems. Especially, the economics of dairy enterprise is based on an efficient productive and reproductive performance of dairy animals (Nibret, 2012).However, many researches have been done on station and only few research works have been carried out on on-farm to evaluate productive and reproductive performance of crossbred that compares different location. Adding to this, there are limited quantified information on about comparative studies undertaken on the milk production potential and relative reproductive performances of crossbred dairy cows distributed to farmers in Walmera district as compared to local/indigenous cows used for milk production in the area. Hence, this study was conducted to evaluate on-farm relative productive and reproductive performance of crossbred and local dairy cows in the study area.

MATERIALS AND METHODS

Description of the Study area

The study was carried out in Walmera District of West Shoa Zone of Oromia, which is located 30km to the west along the main road to Ambo. Geographically, the district is found 9° 0' 0''-9° 10' 0' N latitude and 38° 25' 0''- 38° 30' 0'' E longitudes. The study area has an altitude of 2400m.a.s.l and receives an average annual rainfall of about 1000mm.The mean minimum and maximum temperatures are 6 and 22°C, respectively (WDLDFO, 2017). The mean relative humidity is 59%. The study area obtains short rainy season (March to May), long rainy season (June to September) and dry season (October to February) (HARC, 2008). The total human population of the district is 104,932 and cattle are the dominant livestock of the smallholder farmer in the area, although limited number of small ruminants and equines are kept (WDLDFO, 2017). Animals largely depend on natural grazing, which were supplemented with crop residues late in the dry season.

Research Design

Both qualitative and quantitative approaches were used to assess on-farm productive and reproductive performance of Friesian crossbred and local dairy cows. While collecting this data, interview guide questionnaires and semi-structure questionnaires were used. Besides, key informant interview (KII), Focus group discussion (FGDs) and personal observation were also used to collect the necessary data.

Sampling Techniques and Sample size

Eleven target kebeles: two from urban area and nine kebeles from rural area were selected purposively based on the number of crossbred dairy cows that farmers own, availability of model farmers and ease of access. Sample of respondents from each selected kebeles were selected randomly using stratified random sampling technique. The numbers of respondents in each kebele was selected using proportional to size sampling approach. The sample size to collect data for this research was determined by using Yemane (1967) formula:

$$n = \frac{N}{1+N(e)^2}$$

Where;

n =designates the sample size of the researcher uses;

N= designates total number of households in eleven kebeles.

e =designates maximum variability or margin of error 8 %(0.08);

1=designates the probability of the event occurring.

Therefore;

$$n = \frac{N}{1+N(e)^2} = \frac{300}{1+300(0.08)^2} = 102$$

Method of data collection

Both primary and secondary sources were used for this study. Primary data were collected from respondents by using pre-tested semi-structured questionnaire, key informant interviews, focus group discussion and personal observation. Whereas, secondary data were collected from Agricultural office, published and unpublished materials and CSA reports.

Method of Data Analysis

The collected data from different sources were coded and recorded using Microsoft Excel spreadsheet 2007. Descriptive statistics such as frequency, percentage, means and standard deviation was used to analyze the quantitative data using SPPS version 21 software. Then the analyzed data were presented in the form of table 1, figure 1 and pie chart.

RESULTS AND DISCUSSION

Demographic Characteristics of the respondents

Sex, age and family size

Majority of the respondents in the study area were male (72.5%) and the rest 27.5% were females (Table 1). The highest proportion of the respondents age were ranging from 31-40 years old which accounts about 39.2%, and the second highest proportion age was ranging from 41-50 years old that accounts 27.5%.Thus, the study area had relatively better potential of economically active population who could participate in dairy cattle production.

Majority of the respondents (40.2%) had the family size of 7-9 members and about 23.5% had family size more than 10(Table 1). From this result, it clearly could elucidate that household with more family members tended to have more labor and to adopt dairy technology than household with less family members which in turn increased milk production and then milk market participation of the households.

Education Status and Source of Labor

Literacy wise, nearly half of the respondents (46.1%) were attended elementary education (1-8 grade), whereas 31.4% illiterate and unable to read and write. Out of the total respondents, only 9.8% respondents had secondary education (Figure 1). Education affects the production and management of improved dairy cows; most improved dairy cows breed need high management and husbandry practice such as hoof trimming, dehorning, feeding, watering, heat detection, breeding, vaccination, and deworming. Majority of the respondents who have crossbred dairy cows were educated from elementary up to university and have training on dairy production. Like the current result, according to Lemma (2017), education levels of household heads have impacts on potential of milk production. Therefore, uneducated farmers are challenge for adoption of new technology in the development of dairy sector such as uses of AI for breeding and synchronization. The majority of the labor source of the respondents were own family labor (60.7%), 37.3% own family and daily labor, and only 2% were permanent employee (Figure 2). The reason may to use money paid for labor and proper farm management.This was an indication that dairy cattle management requires the attention of family members since they have high value. In line with the current result, different authors: Megersa *et al.* (2011); Gillah (2012) reported the same result from different parts of the country.

Production Performance

Daily milk yield and Lactation Length

In the study area, the overall daily milk yield of local, 50% HF crossbred and above 50% HFx local of dairy cows were 2.02±0.8, 7.18±1.47 and 11.56±2.3 litters, respectively (Table 2). The present average daily milk of crossbred of HF above 50% is slightly similar with the report of Dessalegn *et al*. (2016) who reported in Bishoftu and Akaki town. However, Bayisa *et al.* (2017) reported the lowest overall average daily milk yield of local and crossbred 1.42±0.15 and 4.5±0.12 in Gindeberet and Abuna-Gindeberet. The better daily milk yield in the study area compared to other part of the country might be, due to the improvement of dairy cows' management and husbandry practice of the farmers and experienced good in dairy cows management systems.

Lactation length refers to the time of period from when a cow starts to secrete milk after parturition to the time of drying off. The lactation length overall mean and standard deviation of local, 50% HF x local and above 50% HF x Local of dairy cows were 6.11±1.53, 8.62±1.41 and 9.31±1.2 in months, respectively (Table 2). The current estimated average lactation length was shorter than the ideal lactation length of 305 days defined by Foley *et al.* (1972). This might be due to the extended utilization of the farmers for more milk production which is responsible for extended calving interval.

Reproduction performance

Reproductive efficiency of a herd is an important component of dairy cattle productivity in the world. Economic losses because of poor fertility can be

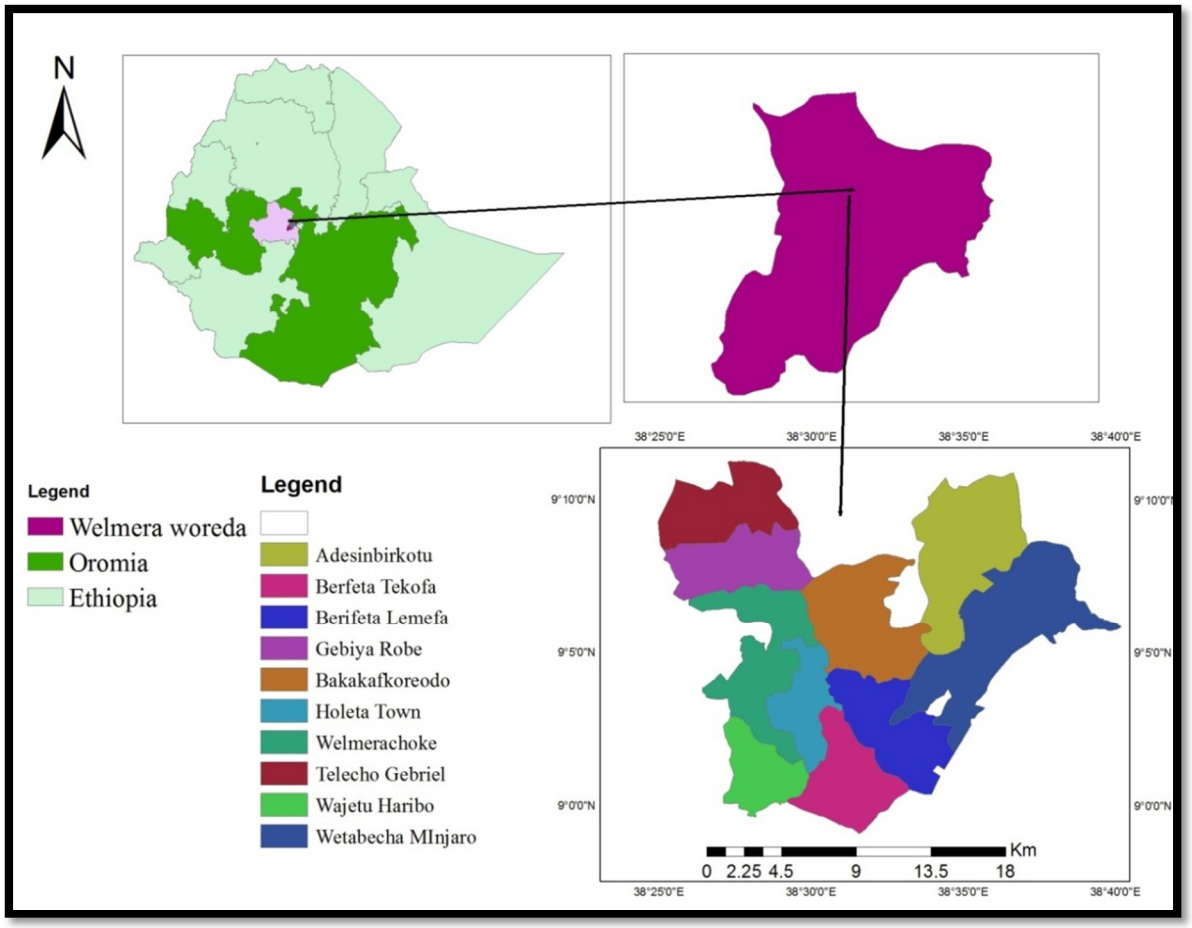

Figure- 1: Map of the study area

Table 1: Respondent Sex, Age group and Family Size in study area

Variables		Frequency	% respondents
Sex	Male	74	72.5
	Female	28	27.5
	Total	102	100
Age of the respondent	18-30	7	6.9
	31-40	40	39.2
	41-50	28	27.5
	51-60	40	39.2
	61-70	5	4.9
	Total	102	100
Family size	1-3	4	3.9
	4-6	33	32.4
	7-9	41	40.2
	above 10	24	23.5
	Total	**102**	**100**

attributed to the cost of prolonged calving interval, increased insemination costs, reduced returns from calves born and forced replacements in the event of culling. A delay in conception because of poor fertility increases calving interval mostly due to the increase in the number of days from calving to conception (Nishida *et al.*, 2006).

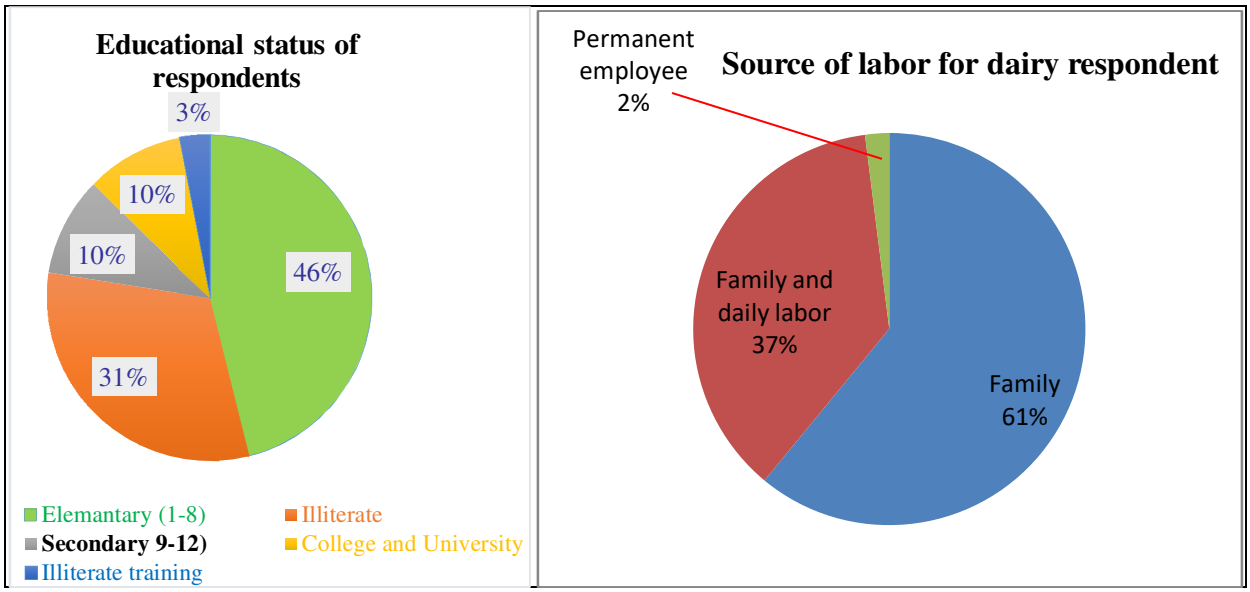

Figure 2: Educational status and source of labor of respondents for dairy in study

Table 2: On-farm daily milk yield and lactation length of dairy cows in the study area

Daily milk Yield in litter				
Breed	**N**	**Mean ±SD**	**CV**	**LSD**
Local	102	2.02±0.8^{c}	0.64	0.8
HF 50%	102	7.18±1.47^{b}	2.15	1.47
HF Above 50%	102	11.56±2.3^{a}	5.29	1.04
Lactation length in months				
Breed	**N**	**Mean ±SD**	**CV**	**LSD**
Local	102	6.11±1.53^{c}	2.33	1.53
HF 50%	102	8.62±1.41^{b}	1.98	1.41
HF above 50%	102	9.31±1.2^{a}	1.43	1.2

Means in the same column with different superscripts are significantly different at P<0.05

Calving interval and Day Open

The calving interval is the period between two consecutive parturitions (the gap between two successive calving), and ideally should be 12 to 13 months. TheCI overall mean and SD of local, 50% HF x local and above 50%% HF x Local dairy cows were 15.03±1.04, 14.48±1.19 and 14.02±1.04 months, respectively(Table 3). In contrast, prolonged overall CI 22±4.4 months of crossbred dairy cows in north Shoa was reported by Mulugeta and Belayneh (2013) and 22.19±7.73 of local in Dandi district (Belay *et al*., 2012). The poor feeding practices, adversely affect the synthesis and secretion of hormones responsible for ovarian follicular development and function leading to extended CI in cows.

The DO overall mean and standard deviation of local, 50% HF x local and above 50% HF x Local of dairy cows in the study area were 7.64±2.65, 5.70±1.38 and 4.75±1.12 in months, respectively (Table. 3). The current value of DO was longer than that reported for crossbred cows (2.47 months in urban and 3.33 months in pre-urban areas) in Gondar town (Nibret, 2012) and shorter than that reported by Assaminew and Ashenaf(2015) in Central Highland of Ethiopia 5.07 and 5.87 months in urban and pre-urban, respectively.

Age at First Service and Age at First Calving

Overall mean AFS and standard deviation of local, 50% HF x local and above 50% HF x Local dairy cows were 42.23±7.4, 29.02±2.65 and 22.69±3.98 months, respectively. The AFS of crossbred is comparable with the report of Yohannes *et al. (*2016).The better average AFS of 50% HF x local recorded might be due the fact that most of the respondents in study area were educated at least from short term training up to high level, experienced on dairy production and good management, husbandry, feeding, watering and better health care practiced.

The average age at first calving of local, 50% HF X

Table 3: On-farm Calving Interval and Day Open of dairy cow in months in Walmera District.

Calving Interval in months				
Breed	**N**	**Mean ±SD**	**CV**	**LSD**
Local	102	15.03 ±1.04[a]	1.08	1.04
HF50%	102	14.48 ±1.19[b]	1.19	1.2
Above 50%HF	102	14.02 ±1.04[c]	1.08	1.04
Day Open in months				
Breed	**N**	**Mean ±SD**	**CV**	**LSD**
local	102	7.64±2.65a	39.6	0.64
50%HF	102	5.70 ±1.42[b]	24.99	2.2
above 50%HF	102	4.75 ±1.12[c]	23.65	1.26

Means in the same column with different superscripts are significantly different at P<0.05

Table 4: Age at First Service and Calving of Heifer in Months in Walmera District.

Age at first Service in month				
Breed Type	**N**	**Mean ±SD**	**CV**	**LSD**
Local	102	42.23±7.4[c]	54.69	7.4
HF50%	102	29.02±2.65[b]	7.02	5.43
HF above 50%	102	22.69±3.98[a]	15.86	3.98
Age at first calving in months				
Breed Type	**N**	**Mean ±SD**	**CV**	**LSD**
Local	102	51.73 ±6.97[c]	48.64	6.97
HF50%	102	38.14±5.43[b]	29.5	527
HF above 50%	102	31.75±4.08[a]	16.64	4.08

Means in the same column with different superscripts are significantly different at P<0.05

local and above 50% HF x Local dairy cows were 51.73±6.9, 38.14 ± 5.43 and 31.75 ±4.08, respectively (Table 4). Compared to the current finding, short age at first calving 29.35±4.84 and 36.4±17months were reported for cross breed cattle by Blen (2016).

CONCLUSIONS AND RECOMMENDATION

In general, in the study area the overall mean dairy cows production and reproduction performance trait (Daily milk yield, Lactation length, Day open, Calving interval, Age at first service and Age at first calving) were more effective than some part of Ethiopia and still less than commercial dairy farm, ideal standard and on station research findings. These lower values could be due to environmental factors like in adequate supplementary and quality feeds, poor health care, and heat detection problem, lack of comprehensive breeding policy and insufficient use of new reproductive technology. Based on the above conclusion, the following recommendations were forwarded:

- Regardless of their genetic merit, local dairy cow must be up-graded to composite the high price of animal feed cost and high demand of milk.
- Organizing producer participator dairy cooperative and encourage them to establish strong dairy product market value chain and milk processing plants.
- For breed improvement, AI is critical but it is not easily accessible and hence the government and concerning body must hard work on it.
- In order to achieve the maximum potential of production and reproduction performance of dairy cows over all dairy development strategy should get due attention; and the following issues need further analysis to increase the income of the farmers in the study areas:
- On-farm crossbred male calves could possibility be used for feasible to fatten as dairy beef and need further investigation
- Milk marketing value chain, participatory producer dairy cooperative and milk processing center problem need further investigation.

LIST OF ABBREVIATIONS

masl: Meter above sea level
HARC: Holeta Agricultural Research Cente
WDLFO: Walmera District Livestock Development and Fishery Office

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