Evaluationof Management Levels and Performance of Crossbred Dairy Cattle Demonstrated to Smallholder Farmers in the Central Highlands of Ethiopia

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ABSTRACT

Astudy was conducted in three districts (Dirre Inchinni, Walmara and Ada'a Berga) of West Shewa Zone of Oromiya National Regional State to evaluate the management levels, and production and reproductive performance of dairy cattle on smallholder farms. A total of 90 households (Dirre Inchinni-15, Walmara-47 and Ada'a Berga-28) having at least one crossbred dairy cattle were purposively selected and individually interviewed. The sample respondents had an average experience of 7.16 (range 4.93-12.78) years in dairy production. Theyon averaged owned 1.71 milking cows, 1.40 dry cows, 1.62 pregnant cows, 1.37 heifers and 1.46 calves. The average milk yield at first parity was 9.61 litters (L)/cow/day ranging from 8.54-10.50 L/cow/day. There was variation (P<0.05) in milk yield among the districts with the highest (10.50 L/cow/day) recorded at Ada'a Berga. The longest lactation length (10.27 months) was reported at Dirre Inchinni with no significant difference (P>0.05) among the districts. The average number of service per conception was 2.0, ranging from 1.93 at Ada'a Berga to 2.18 at Walmara. The average age at first calving was 30 months with a narrow range of 28.80 to 30.20 months. Similarly, calving interval ranged between 13.23 to 14.81 months with a mean of 14.26 months. Most (92.9, 46.7 and 80.2%) of the respondents in Ada'a Berga, Dirre Inchinni and Walmara, respectively, were using artificial insemination for breeding their animals. Dairy cattle were housed in separately constructed houses according to majority of the respondents. About 75.6% and 96.7% of the respondents respectively produce improved forages and purchase supplementary feeds for their dairy animals.River was reported to be the main source of water for animals mainly during the dry season. In general, the farmers in the study area apply improved dairy cattle management practices with better daily and lactation milk yield, and reproductive performance of the animals as compared to other areas with less crossbred dairy animals. Thereforeit is recommended to share the experience of the farmers in the study area to other farmers and implement intensive trainings to make the dairy sector more productive.Finally, it would be necessary to conduct cost-benefit analysis or analysis of production costs to clearly understand the contribution of dairy farming tothe livelihood of smallholder farmers.

Key words: Crossbred, Management, Production, Reproduction performance

INTRODUCTION

Although indigenous Zebu cattle are more adapted to tropical environment, their capacity for milk production is usually low. Selection for high milk production within indigenous cattle would require a long-term genetic improvement program. To meet the ever-increasing demand for milk, milk products and their contribution to economic growth, genetic improvement through crossing of the indigenous with exotic cattle has been proposed as one of the options (Aynalem *et al.*, 2009). In Ethiopia, crossbred cattle mainly cross of zebu with Holstein-Friesian cattle have been used for milk production for decades (Niraj *et al*., 2017). However, fertility rate of crossbred, high grade and pure breed exotic dairy cattle suffered from poor reproduction performance, poor conception rate, long post-partum anestrous and calving interval (Madalena *et al.*, 1990).These lower reproductive performances could be related to genetic, environment and management factors. Management factors such as accuracy of heat detection, use of proper insemination techniques, proper semen handling, and appropriate herd health policies can directly influence the reproductive performance of a dairy herd (Fikre, 2007).

The success of dairy production in general and crossbreeding program in particular needs to be monitored regularly by assessing the productive and reproductive performance under the existing

management system. In Ethiopia, the poor genetic potential accompanied with substandard feeding, poor healthcare and management practices are the main contributors to low productivity of dairy cattle. Hence, there is a need to periodically evaluate the reproductive and productive performance of dairy cattle and factors affecting their performance. Information is limited about the performance of dairy cows in smallholder urban and peri-urban dairy farms in the tropics, particularly in Ethiopia (Lobago *et al*., 2007).

A large number of smallholder dairy farmers are operating in the central highlands of Ethiopia due to the proximity to different organizations working on dairy research and development. On-farm participatory verification of improved dairy cattle production packages has started since 2000 as a result more than 315 crossbred dairy cows were demonstrated to 10 districts including the study areas (Kefena *et al.,* 2016). However, market opportunities for their products, information on management levels, productive and reproductive performance of crossbred dairy cattle demonstrated to smallholder farmers, were not well assessed and documented. Therefore the objectives of this study were to evaluate the management levels and production and reproductive performances of dairy animals demonstrated to smallholder farmers.

MATERIALS AND METHODS

Description of study areas

The study was conducted in Dirre Inchinni, Walmara and Ada'a Berga districts which are located in West Shewa Zone of Oromia National Regional State. West Shewa Zone was selected based on the number of crossbred dairy animals demonstrated and the experiences of the farmers in managing dairy animals. Dirre Inchinni is located at a distance of 40 km from Ambo (the capital of West Shewa Zone) with an annual rainfall ranging between 1000to 1400 mm. Average minimum and maximum daily temperatures are 8.8^0 C and 21.6^0C, respectively (PSEP, 2011).

Walmara district is located at 9°00'N latitude, 38°30'E longitude withan altitude of 2400 m above sea level (masl). It is 34 km west of Addis Ababa and hasan average annual rainfall of 1055 mm, average relative humidity of 60.6% and average maximum and minimum daily temperature of 22.2°c and 6.1°c, respectively (HARC, 2010).The area is a typical mixed crop-livestock production system, where small-scale dairying based on crossbred animals is commonly practiced.

Ada'a Berga district is located in the central highlands of Ethiopia at $9^0$16'N latitude and $38^0$23'E longitude, 70 km west of Addis Ababa and 35 km North West of Holetta town on the main road to Muger. It lies at an altitude of 2500 masl. It is characterized by cool sub-tropical climate with the mean annual temperature and rainfall of 18^0c and 1225 mm, respectively (HARC, 2010).

Table 1: Districts participated in dairy technology transfer and number of farmers participated in the program up to 2015.

Districts	Number of participant farmers
Walmara and Ejere	142
Dandi	49
Jeldu	38
Ambo and Guder	25
Weliso	12
Dirre Inchinni	33
Kersa Malima	10
Ghoa Tshion	6
Total	**315**

Source: Kefena *et al*. (2016)

Sampling method and data collection

Among the districts of West Shewa zone, three districts (Ada'a Berga, Dirre Inchinni and Walmara) having relatively large number of crossbred dairy animals were purposively selected. From each district, two peasant associations (PA) were selected. A total of 90 households (Dirre Inchinni-15, Walmara-47 and Ada'a Beraga-28) having at least one crossbred dairy cowwere purposively selected and individually interviewed. Data was collected in formal survey using pre-tested structured questionnaires which includes: - household characteristics, local and crossbred cattle holding size, production and reproductive performance of crossbred animals, feeding, feed availability and types, housing, marketing and diseases affecting crossbred dairy animals. Secondary data were also collected from livestock and fishery development office, and other documented sources.

Statistical analysis

Qualitative and quantitative data sets were analyzed using Statistical Package for Social Sciences (SPSS, Version 20).

RESULTS AND DISCUSSION

Land holding and land use pattern

The overall average land owned by a household (hh) in the study areas was 2.93 hectares(ha) with the range of 2.60-4.04 ha (Table 2). The average land allocated for crop production varied from 1.68 to 2.23 ha while that of grazing land was in the range of 1.02 to 1.27 ha. In general, the sample households in the study districts allocated about 1.82 ha (42.12%) for crop production and 1.14 ha (26.38%) for grazing. Contrary to this study, Gezahegn *et al.*(2016) reported the average land allocated for crop production, grazing, hay making and improved forage production in Bench-Maji, Sheka and Majang zones was in the order of 1.95, 0.39, 0.13 and 0.14 ha, respectively. The variation in land allocation for different purposes in these districts might be due to differences in the land holding size of the respondents.

Table 2: Land holding and land use pattern in the study areas (ha)

Land allocation for different purposes	Districts				Sig. Level
	Ada'a Berga	Dirre Inchinni	Walmara	Overall Mean	
Total land owned	2.95±0.72 (28) *	4.04±2.05(15)	2.62±1.56 (46)	2.93±1.49 (89)	***
Crop land	1.68±0.58(26)	2.23±1.29(15)	1.76±1.21(47)	1.82±1.08(88)	NS
Grazing land	1.27±0.58(22)	1.14±0.84(14)	1.02±0.22(26)	1.14±0.55(62)	NS
Land for hay making	0.95±0.15(20)	1.11±0.33(9)	1.07±0.26(14)	1.02±0.24(43)	NS
Land used for other purposes	0.70±0.20(5)	0.83±0.25(6)	1.29±0.48(7)	0.97±0.42(18)	**

* =numbers in the parenthesis are number of respondents

Number of local and crossbred cattleowed by respondents

Number of local cattle

The average number of local cattle owned by the sample households 1.39 milking cows, 1.62dry cows, 1.64pregnant cows, 2.22 heifers and1.27 calves (Table 3). In agreement to this finding, Gezahegn *et al.* (2016) reported that the mean number of cows, heifers, female calves and male calves in the order of 3.3, 2.3, 1.5 and 1.7, respectively. Similarly Mezgeb *et al.* (2016) reported the mean numbers of cows, heifers > 12 months, heifers 6-12 months and female caves in Arsi-Bale zones were 2.49, 1.82, 1.52 and 1.48, respectively.

Table 3: Local cattle holding of the sample respondents

Types of local cattle	Districts			
	Ada'a Berga	Dirre Inchinni	Walmara	Overall Mean
Milking cows	1.00±0.00 (10) *	1.87±0.99 (8)	1.39±0.77(18)	1.39±0.76(36)
Dry cows	1.33±0.57(3)	2.17±0.75(6)	1.42±0.90(12)	1.62±0.86(21)
Pregnant cows	1.00±0.00(2)	1.67±0.57(3)	1.78±1.30(9)	1.64±1.08(14)
Heifers	1.00±0.00(8)	4.20±3.56(5)	2.21±1.36(14)	2.22±2.02(27)
Calves	1.08±0.28(12)	1.40±0.54(5)	1.44±0.52(9)	1.27±0.45(26)
Oxen	1.90±0.30(20)	2.0±1.04(12)	2.78±1.33(46)	2.22±0.89(78)

*= numbers in the parenthesis are number of respondents

Number of crossbred cattle

Respondents in the study districts had 7.16 (range 4.93-12.78) years of experience in improved dairy production. There was significant variation (P<0.05) in the experience of the respondents in improved dairying which could be attributed to the difference in time of distribution of crossbred heifers to farmers. As shown in Table 4, the average ownership of improved cattle by the sample households include1.71 milking cows, 1.40 dry cows, 1.62 pregnant cows, 1.37 heifers and 1.46 calves. According to Mulisa *et al.* (2011) the number of lactating cows, pregnant cows, heifers and calves owned per household around Bishoftu town was 1.29, 0.9, 0.84 and 0.64, respectively. In agreement to the present study, Million *et al. (*2015) reported that the mean number of dairy cows and calves owned per household in Walmara district was 2.6 and 1.6, respectively. Similarly, Solomon (2016) also reported a dairy herd structure of pregnant cows (0.69), lactating cows (1.2), heifers (1.1) and calves (1.3) for smallholder farmers around Debrebrhan town.

Table4: Crossbred cattle holding of the sample respondents

Crossbred cattle	Districts			
	Ada'a Berga	Dirre Inchinni	Walmara	Overall Mean
Milking cows	1.44±0.69(27) *	1.54±0.87(13)	1.97±1.25(37)	1.71±1.05(77)
Dry cows	1.00±0.00(4)	1.33±0.51(6)	1.60±0.96(10)	1.40±0.75(20)
Pregnant cows	1.62±0.80(21)	1.23±0.43(13)	1.79±0.86(29)	1.62±0.79(63)
Heifers	1.60±0.75(20)	1.33±0.50(9)	1.20±0.57(25)	1.37±0.65(54)
Calves	1.26±0.65(19)	1.13±0.35(8)	1.69±0.85(29)	1.46±0.76(56)

*= numbers in the parenthesis are number of respondents

Production performance of crossbred dairy animals in the study areas

Daily Milk Yield (DMY)

The milk production performance of crossbred dairy cows is presented in Table 5. The average milk yield at first parity was 9.61 L/cow/day with the range of 8.54-10.50 litters/cow/day. There was significant difference (p< 0.05) in milk yield among districts with the highest (10.50 L/cow/day) at Ada'a Berga district. This difference in milk yield among districts might be due to differences in the management of the animals and exotic blood level of the animals. The average daily milk yield during second and third parties were 9.80 and 8.76 L/cow, respectively. Similar to this finding, Kumar *et al.* (2014), Yohannes *et al.* (2015) and Sena *et al.* (2014) reported a milk yield of 9.87, 9.43 and 9.91 L/day/cow from crossbred dairy cows in Gonder, Walmara and Debretabor, respectively. Contrary to the present study, Gebrekidan *et al.* (2012), reported lower (6.8 L) daily milk yield from crossbred dairy animals in central zone of

Tigray. Zenebe *et al.* (2016) reported relatively higher (11.48 L) daily milk yield from crossbred dairy cows in Addis Ababa and Bishoftu towns. In another study, Dessalegn (2017) reported a daily milk yield of 11.6 and 10.8 L from crossbred dairy cows in Bishoftu and Akaki, respectively. The variation in milk yield in different areas is mostly due to differences in management of the animals, resource availability, experiences of the farmer and blood level of the animals.

Lactation Length (LL)

The mean lactation length of crossbred dairy cowsin the study areas was 9.64 months (Table 5). The longest lactation length (10.27 months) was reported at Dirre Inchinni and there was non-significant difference (p>0.05) across the districts. Similar to this finding, Sena *et al.* (2014) and Dessalegn *et al.* (2016) reported 9.1 and 9.2 months of lactation length for crossbred dairy cows in Debretabor and Bishoftu towns, respectively. Contrary to the current finding, Yohannes *et al.* (2015) reported a higher lactation length of 14.4 and 12.96 months for crossbred dairy cows in Walmara and DirreInchinni districts, respectively. This difference in lactation length in the same districts at different times might be due to lack of record keeping experience by the farmers. On the other hand Gebrekidan *et al.* (2012) reported lower (7.6 months) lactation length for crossbred dairy cows in central zone of Tigray.

Table 5: Milk productivity (L/cow/day) and lactation length (months) of crossbred dairy cows in the study areas

Crossbred cattle		Districts				Sig. Level
		Ada'a Berga	Dirre Inchini	Walmara	Overall Mean	
Lactation length		8.75±3.40	10.27±1.98	9.98±3.09	9.64±3.07	NS
Daily milk yield by parity	First	10.50±2.79	8.5z4±2.22	9.38±2.49	9.61±2.61	**
	Second	10.08±2.62	8.50±1.28	10.05±2.58	9.80±2.47	NS
	Third	8.29±2.12	7.86±1.79	9.61±3.66	8.76±2.93	NS
	Fourth	-	7.08±2.13	11.29±5.05	8.55±3.90	NS
	Fifth	-	6.62±2.50	6.00±2.00	6.47±2.34	NS

Reproductive performance of Crossbreed dairy cows in the study districts

Service per Conception (SPC)

The mean number of service per conception in the study districts was 2.0, with the highest (2.18) at Walmara and the lowest (1.93) at Ada'a Berga (Table 6). In agreement to this finding, Debir (2016), Zenebe *et al.*(2016), Niraj *et al.*(2017) and Wondossen *et al*. (2018) reported 1.8,1.96, 1.8 and 2.18 SPC for crossbred dairy cows in Sidama Region, around Addis Ababa, in and around Bishopftu (Debre Zeit) and in south western Ethiopia, respectively. Moreover, Hunduma (2012) and Sena *et al.* (2014) also reported that the mean number of service per conception for crossbred cows was 1.56 and 1.52, respectively.The differences in number of service per conception could be attributed to differences in management practices such as proper heat detection and timely insemination.

Age at First Calving (AFC)

The mean age at first calving in the study districts was 30 months with the range of 28.80-30.20 months. This valueislower than the value (36.96 months), (34.8 months), (35.3 months), (35.7 months) and (39.3 months) reported by Gebrekidan *et al.* (2012), Hunduma (2012), Alemselam *et al.* (2015), Yohannes *et al.* (2015) and Debir (2016), respectively. Contrary to this study, lower age at first calving was reported by Meseret *et al.* (2014) and Dessalegn *et al.* (2016).

Calving Interval (CI)

The mean calving interval of dairy animals in the study areas was 14.26 months and ranged from 13.23-14.81 months (Table6). The present finding is in agreement with Hunduma (2012); Sena *et al.* (2014); Alemselam *et al.* (2015) and Dessalegn *et al.* (2016) who reported a calving interval of 12.25 months in Ethiopia, 12.88 months in Debretabor, 13.2 months around Mekele and 13 months in Bishoftu town, respectively. Contrary to this findings a higher calving interval of 17.4 months in central zone of Tigray, 17.1 months in Sidama, 14.36 months in and around Addis Ababa, 15.22 months around Debre Zeit and 20.19 months in south western Ethiopia was reported by Gebrekidan *et al.* (2012); Debir (2016); Zenebe *et al.* (2016); Niraj *et al.* (2017 and Wondossen *et al*. (2018), respectively.

Table 6: Reproductive performance of crossbred dairy cows in the study areas

Reproductive traits	Districts			
	Ada'a Berga	Dirre Inchinni	Walmara	Overall Mean
Service per conception(N)	1.93±0.94(28)	2.00±0.84(15)	2.18±1.05(47)	2.07±0.98(90)
Age at first calving (M)	28.80±0.94(28)	30.00±0.71(15)	30.20±2.31(47)	30.00±1.78(90)
Calving intervals (M)	13.23±2.31(28)	14.47±2.13(15)	14.81±3.54(47)	14.26±3.05(90)

*M=Months N=Number of respondents

Dairy cattle breeding and culling practices

Table 7 presents the kinds of mating and culling practices of dairy cattle in the study areas. About 92.9, 46.7 and 80.2% of the respondents in Ada'a Berga, Dirre Inchinni and Walmara, respectively were using artificial Insemination (AI) for breeding their animals. In agreement to this, Million *et al.* (2015); Mekuria (2016) and Abadi *et al.* (2017) reported that 92%, 72.1% and 56.67% of respondents, respectively, use AI for breeding. This indicates that majority of dairy farmers use AI mostly because of high cost of managing breeding bulls and/or availability of AI service in the areas. On the other hand,large proportion(53.3%) of the respondents in Dirre Inchinni were using nature mating (controlled) for breeding their animals mostly due to lack or shortage of AI facilities. In agreement to this, Mulisa *et al.* (2011) and Abadi *et al.* (2017) reported that 46.4 and 43.33% smallholder dairy farmers in Bishoftu and Adigrat, respectively use breeding bulls for mating their dairy animas.

According to the present study old age, low milk yield and infertility of the animals were the criteria used for culling dairyanimals from the herd (Table 7). However, even if the cows produce low amount of milk, the respondents in all the study districts tend to keep their cows till they become too old due to shortage or high price of replacement dairy heifers.

Table 7: Animal breeding and culling practices in the study areas (% age of respondents)

Practices		Districts		
		Ada'a Berga	Dirre Inchinni	Walmara
Mating system used for crossbred dairy cows	Natural mating	7.2 (2)*	53.3 (8)	19.2 (9)
	Artificial Insemination	92.9 (26)	46.7 (7)	80.2 (38)
Criteria used for culling crossbred dairy cows	Old age	61.5 (16)	60.0 (9)	50.0 (22)
	Low milk production	34.6 (9)	33.3 (5)	20.5 (9)
	Infertility	3.8 (1)	6.7 (1)	11.4 (5)
	Sickness	-	-	18.2 (8)

*= Number of respondents

Calf rearing practices

Calf rearing practice in the study areas indicated that calves are weaned at an average age of 5.2 months and within the range of 4.64-6.27 months (Figure 1). The weaning age at Walmara district was the lowest (4.67 months), which could be attributed to the better awareness of farmers in selling milk. About 74.1, 66.7 and 64.3 % of the respondents in Ada'a Berga, Dirre Inchinni and Walmara districts, respectively, use partial suckling for feeding their calves (Figure 2). Since higher percentage of respondents practice partial suckling, it is not possible to know the amount of milk a calf consume so this is a good indication of lack of awareness of respondents about calf feeding so this could be improved through training.

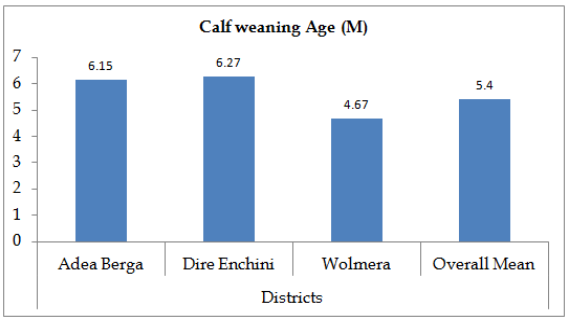

Figure 1.Calf weaning age in months

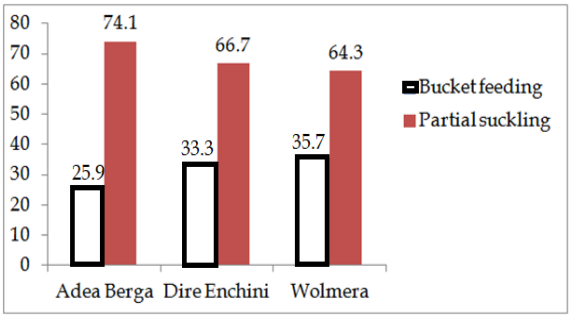

Figure 2.Milk feeding practice for calves

Housing and materials used for housing

Most respondents at Ada'a Berga, Dirre Inchinni and Walmara were housing their animals in separately constructed houses (Table 8). This indicates that most of the respondents have the awareness of keeping the animals in separately constructed houses which is contributing for human health by reducing the transmission of zoonotic diseases. In agreement to this finding, Gezahegn *et al.* (2016) reported that81.2% of respondents was keeping their animals in separately constructed houses. Similarly, Mezgeb *et al.* (2016) reported that majority of dairy farmers Arsi (66.3%) and West Arsi (61.2%) zones were housing their animals in separately constructed houses. As shown in Table 8, majority of the respondents in Ada'a Berga, Dirre Inchinni andWalmara were using corrugated iron sheet roofed house for their animals. This indicate that most of the respondents in the study areas had the awareness of keeping the animal in appropriate housestoprotect their animals from rain, wind and any other environmental stress. Only few (15.6%) and (13.3%) of the respondents in the study areas use grass thatches and plastic sheets as housing materials, respectively.

Table 8: Housing and materials used for housing dairy animals in the study areas (% age of respondents)

Housing and housing materials		Districts			Overall mean
		Ada'a Berga	Dirre Inchinni	Walmara	
How do you house your animals	Adjoining house	3.6	-	8.5	5.6
	Separately constructed	96.4	100	80.9	88.8
	Together with households	-	-	10.6	5.6
Housing materials used (Roof type)	Grass thatches	25	6.7	12.8	15.6
	Iron sheet	46.7	93.3	78.7	71.1
	Plastic sheet	28.6	-	8.5	13.3

Improved forage production and concentrate supplementation

About 75% and 96% of the respondents in the study areas respectivelyreported to produce improved forages and purchase supplementary feeds for their dairy animals (Table 9). In contrary to this finding, Endale *et al.* (2016) and Gezahegn *et al.* (2016) reported that 74.4% and 95% of the sampled households in Meta Robi district and Bench Maji, Sheka and Mejenger zones did not produce improved forage crops. Relatively large land holding of the respondents, proximity to different organizations working on dairy and experience of the farmers on daring might have contributed for better awareness of farmers to produce improved forage crops on their land in the study districts.

As shown in Figure3, about 75% of the respondents purchase both oil seed cakes and wheat bran, 14.4% purchase wheat bran alone and 7.8% of the respondents purchase only oil seed cakes to supplement their animals. Generally, the respondents in the study areas provide concentrates and improved forages with better nutritive value than natural pasture in order to keep their animals healthier and produce more milk.

Table 9: Improved forage production and concentrate supplementation practices

Feed production and supplementations		% of respondents
Do you grow improved forages	Yes	75.6
	No	24.4
Do you buy any feed supplements	Yes	96.7
	No	3.3

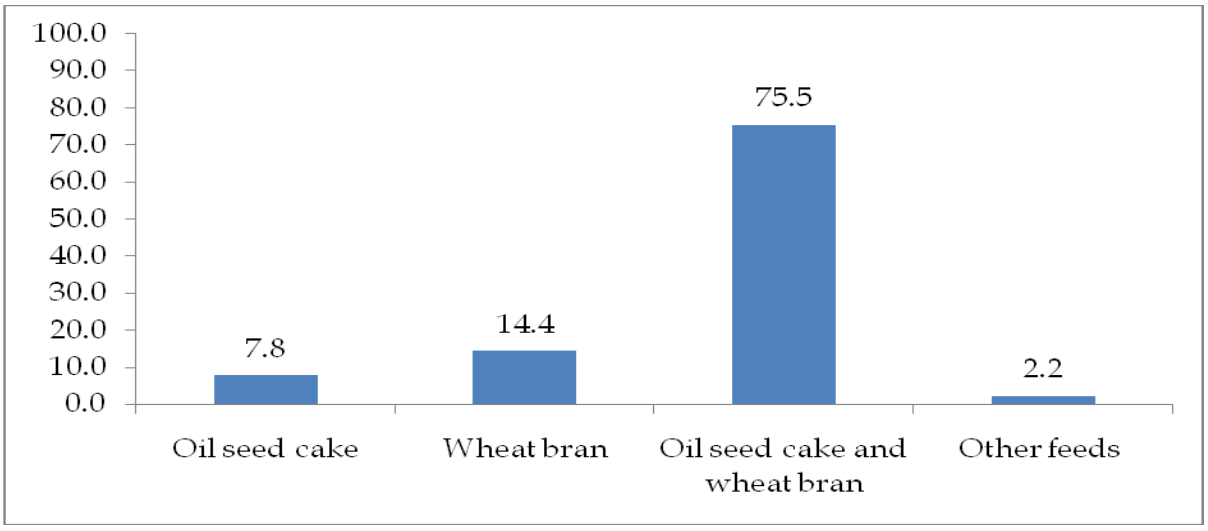

Figure 3: Feed ingredients used for supplementing dairy cattle in the study areas

Crop residues utilization practices

Majority of the respondents in Ada'a Berga, Dirre Inchinni and Walmara use crop residues for feeding dairy cattle. This indicates that the availability of other feed sources was limited. In agreement to this study, Endale *et al.* (2016) reported that the proportion of crop residues as animal feed (76.72%) was higher as compared to other feed types in Meta Robi district. Yeshitila *et al*. (2008) also reported crop residues alone accounted for 78.72% of livestock feed supply. However, the nutritive value of crop residues is very low for dairy cows. To improve the nutritive value and palatability of crop residues, more than 49% of the respondents reported practicing treatment using molasses or salt (Figure 4).

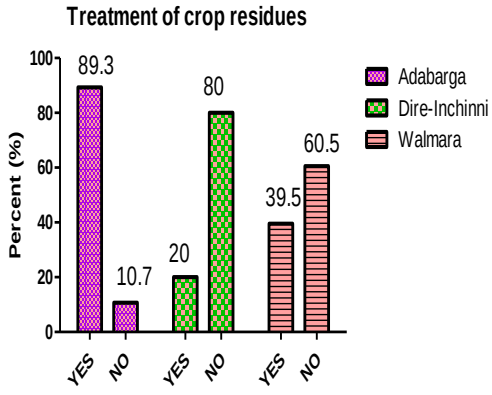

Figure 4. Crop residue treatment practices

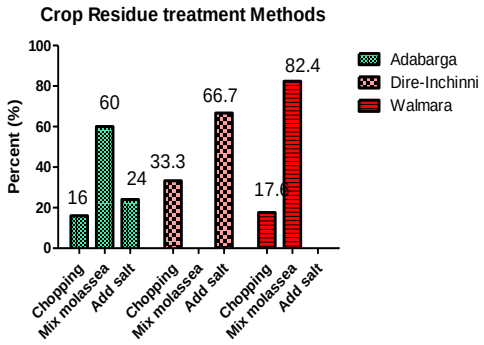

Figure 5. Crop residue treatment methods

Source of water

Most respondents in Ada'a Berga (39.3%), Dirre Inchinni (66.7%) and Walmara (44.7%) districts use river as major source of water for dairy animals during the dry season (Table 10). In agreement to this finding, Gezahegn *et al.* (2016); Kasa *et al.* (2016) and Mezgeb *et al.* (2016) reported that 94.7, 75.4-96.5 and 79.5% of surveyed dairy farmersuse river as source of water for their animals in Benchi Maji, Sheka, Mejenger, Jimma and Ilu Aba Bora and Arsi Bale zones, respectively. Most respondents in Ada'a Berga, Dirre Inchinni and Walmara provide water to their dairy animals by transporting water from its source. Significant numbers of respondents in all districts providewater by transporting which significantly contribute in reducing the energy and time spent by the animal in searching water from longer distance.

Table 10: Sources of water and ways of availing waterto dairy animals (% of respondents)

Water availability and source		Districts			Overall mean
		Ada'a Berga	Dirre Inchinni	Walmara	
Sources of water during dry seasons	River	39.3 (11)*	66.7 (10)	44.7 (21)	39.3 (21)*
	Pond	32.1 (9)	-	23.4 (11)	32.1 (9)
	Pipe	28.6 (8)	33.3 (5)	31.9 (15)	28.6 (8)
How do you avail water for your animals	Transportation	66.7 (19)	53.3 (8)	92.9 (44)	66.7 (19)
	Track the animals to water point	33.3 (9)	46.7 (7)	7.1 (3)	33.3 (9)

* = Number of respondents

CONCLUSIONS

The reported performance of crossbred dairy cattle in the study area was encouraging with better daily and lactation milk yield, age at first calving, calving interval and number of services per conception. This improved performance might be due to intensive training of farmers, closer supervision by researchers during demonstration, proximity of the area to research and development organizations for support and above all the experience of the farmers in dairying. Thus, experience sharing among farmers, intensive trainings and closer supervision by researchers and extension staff should be targeted to make the dairy sector more productive. Finally, production cost analysis should be carried out to clearly understand the contribution of dairy farming to the livelihood of smallholder farmers.

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REFERENCES

Abadi Nigus, Zemede Ashebo, Tekeste Zenebe and Tamirat Adimasu. 2017. Assessment of Dairy Production and Management Practice under Small Holder Farmer in Adigrat Town. Journal of Natural Sciences Research www.iiste.org ISSN 2224-3186 (Paper) ISSN 2225-0921 (Online) Vol.7, No.13, 2017

Alemselam Birhanu, Christopher Harlow, Goitom Gidey, Desalew Tadesse, Gidena Desta, Tadesse Gugssa, Simon C. 2015. Assessment of Reproductive Performance and Problems in Crossbred (Holstein Friesian X Zebu) Dairy Cattle in and Around Mekelle, Tigray, Ethiopia.Animal and Veterinary Sciences. Vol. 3, No. 3, 2015, pp. 94-101. doi: 10.11648/j.avs.20150303.14

Aynalem Haile, Joshi, K., Workneh Ayalew, Azage Tegene and Singh, A. 2009. Genetic evaluation of Boran cattle and their crosses with Holstein Friesian in central Ethiopia: milk production traits. Animal 3(4):486-493.

Debir Legesse. 2016. Assessment of Reproductive Performance of Local and Crossbred Dairy Cattle in Sidama Zone, Southern Ethiopia, Journal of Natural Sciences Research www.iiste.org. ISSN 2224-3186 (Paper) ISSN 2225-0921 (Online) Vol.6, No.9, 2016

Dessalegn Genzebu, Berhan Tamir and Gebreyohannes Berhane. 2016. Study of productive and reproductive performance of crossbred dairy cattle under smallholders management system in Bishoftu and Akaki Towns. International Journal of Agricultural Sciences ISSN 2167-0447 Vol. 6 (2), pp. 913-917, February, 2016. Available online at www.internationalscholarsjournals.org © International Scholars Journals.

Dessalegn Genzebu. 2017.Characterization of dairy cattle husbandry practice and Performance under smallholder systems and analysis of Milk value chain and quality in Bishoftu and Akaki towns, Oromia regional state, Ethiopia. PhD thesis Addis Ababa University, Bishoftu, Ethiopia

Endale Yadessa, Abule Ebro, Lemma Fita, Getenet Assefa. 2016. Feed resources and its utilization practices by smallholder farmers in Meta-Robi District, West Shewa Zone, Oromiya Regional State, Ethiopia. Acad. Res. J. Agri. Sci. Res. 4(4): 124-133

Fikre Lobago, 2007.Reproductive and Lactation Performance of Dairy Cattle in the Oromia Central Highlands of Ethiopia. Doctoral thesis Swedish University of Agricultural Sciences Uppsala

Gebrekidan Tesfay, Zeleke Mekuriaw and Gangwar, S.K. 2012. Reproductive and productive performance of dairy Cattle in central zone of Tigray, Northern Ethiopia. I.J.A.B.R., Vol. 2(1) 2012:58-63

Gezahegn Mengistu, Endale Yadessa, Dereje Tulu, Melkam Aleme, Ararsa Bogale, and Kefena Effa. 2016. Livestock Production in Bench-Maji, Sheka, and Mejenger Zones. Proceedings of the Annual National Review Workshop on Results of Livestock Research, 28-30 June 2016, EIAR, Addis Ababa

Holeta Agricultural Research Center (HARC). 2010. Annual Report

Hunduma Dinka. 2012.Reproductive performance of crossbred dairy cows under smallholder condition in Ethiopia.International Journal of Livestock Production Vol. 3(3), pp. 25-28, March 2012 Available online at http://www.academicjournals.org/IJLP DOI: 10.5897/IJLP11.055 ISSN 2141-2448 ©2012 Academic Journals

Kasa Biratu, Saba Haile and Abera Hailu. 2016. Assessment on Feed Availability, Conservation and Utilization in Jimma and Ilu Aba Bora Zones. Proceedings of the Annual National Review Workshop on Results of Livestock Research, 28-30 June 2016, EIAR, Addis Ababa

Kefena Effa, Mengistu Alemayehu, Zewdie Wondatir, Diriba Hunde and Getnet Assefa. 2016. Dairy Cattle Research and Development Demands for Ethiopia. Proceedings of the National Conference on Agricultural Research for Ethiopian Renaissance held on January 26-27, 2016, in UNECA, Addis Ababa to mark the 50th Anniversary of the establishment of the Ethiopian Institute of Agricultural Research (EIAR)

Kumar, N., Eshetie, A., Abreha, T. and Yizengaw, H. 2014. Productive performance of indigenous and HF crossbred dairy cows in Gondar, Ethiopia, Veterinary World 7(3): 177-181.

Fikre Lobago, Merga Bekana, Gustafsson, H. and Kindahl, H. 2007. Longitudinal observation on reproductive and lactation performances of smallholder crossbred dairy cattle in Fitche, Oromia region, central Ethiopia. Tropical Animal Health and Production, 39: 395-403.

Madalena, E., Lemos, M., Teodoro, L., Barbosa, T. and Monteiro, N. (1990). Dairy production and reproduction in Holstein-Friesian and Guzera crosses. Journal of Dairy Science 73: 1872-1886.

Mekuria Solomon. 2016. Smallholder Dairy Farm Management in Ethiopia: Status in Hawassa and Debrebrihan cities. J Veterinary Sci Technol 7: 306. doi:10.4172/2157-7579.1000306

Meseret Tsegaye, Berihu Gebrekidan and Berihun Afera. 2014. Survey on Reproductive Performance of Smallholder Dairy Cows in Hawassa City, Ethiopia. Journal of Reproduction and Infertility 5 (3): 69-75, 2014 ISSN 2079-2166

Mezgeb Workiye, Teklemedhin Teklehaimanot, Mulualem Ambaw, Deriba Hunde and Kefena Effa 2016.Cattle Production in Arsi Bale Zones. Proceedings of the Annual National Review Workshop on Results of Livestock Research, 28-30 June 2016, EIAR, Addis Ababa

Million Tadessa, Yohannes Gojam, Kassahun Melese, Deriba Hunde, Kefena Effa, Zewdie Wondatir and Mola Sumiye. 2015. Cattle Breed and Production System Characterization in Major Milk Sheds. Proceedings of the Annual National Review Workshop on Results of Livestock Research, 30 June 02 July 2015, held at Holetta Research Center, Holetta

Mulisa Megersa, Ashenafi Feyisa, Anteneh Wondimu and Tariku Jibat. 2011. Herd composition and characteristics of dairy production in Bishoftu Town, Ethiopia. Journal of Agricultural Extension and Rural Development Vol. 3(6), pp. 113-117, June 2011.

Niraj Kumar, Berihu Gebrekidan, Nigus Abebe and Etsay Kebede. 2017.Performance of Crossbred Dairy Cows under Farmers' Management in and Around Debre Zeit, Ethiopia. Ethiopian Journal of Veterinary Science and Animal Production (EJVSAP) 1(1): 66-72, December, 2017.

PSEP (Physical and Socio Economic Profile of West Shewa Zone and Districts'). 2011. BFED –Regional data and information core process, Addis Ababa, Jan. 2011. PP. 2-8.

Sena Tadesse, Guesh Fesaha, Adugnaw Abebe, Beletech Hailu and Workalem Dejen. 2014. Assessment of Productive and Reproductive Performances of Crossbred Dairy Cows in Debre Tabor town. Journal of Biology, Agriculture and Healthcare. www.iiste.org. ISSN 2224-3208.V.4,N.23, 2014.

Solomon Mekuria. 2016. Smallholder Dairy Farm Management in Ethiopia: Status in Hawassa and Debrebrihan Cities. J Veterinar Sci. Technol 7: 306. doi:10.4172/2157-7579.1000306

SPSS (Statistical Package for Social Sciences), Version 20

Wondossen Ayalew, Yohannes Besufekad and Wahid Ahmed. 2018. Productive and Reproductive Performance of Crossbred Dairy Cows in Tropical Highland, South Western, Ethiopia. Journal of Reproduction and Infertility 9 (1): 01-08, 2018.

Yeshitila Admassu, Tessema Zewudu and Azage Tegene. 2008. Availability of livestock feed resources in Alaba Woreda, Southern Ethiopia. In: Proceedings of the 16th annual conference of the Ethiopian Society of Animal Production (ESAP) held in Addis Ababa, Ethiopia, October 8 to 10, 2008.

Yohannes Gojam, Diriba Hunde, Million Tadesse, Kefena Effa, Zewdie Wondatir and Roman H/Silasie. 2015. Crossbreeding and Selection of Dairy Cows Suitable for Smallholder Production Systems.Proceedings of the Annual National Review Workshop on Results of Livestock Research, 30 June 02 July 2015, held at Holetta Research Center, Holetta

Zenebe Tekle, Tadesse Guadu, Kassa Demissie, Fentahun Mitku and Yitayew Demessie. 2016. Assessment of Reproductive Performance of Crossbred Dairy Cattle among Dairy Farms in and around Addis Ababa, Central Ethiopia. Global Veterinaria 17 (4): 358-364, 2016