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Performance evaluation of crossbred dairy cows in urban and peri-urban dairy systems of Sebeta Awas wereda, oromia, Ethiopia

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The study was aimed at evaluating performance of dairy cows in urban and peri-urban dairy systems of Sebeta Awas Wereda, Oromia Regional State, Ethiopia. The study used stratified random sampling method to select target farms and sample respondents for the prepared questionnaire. Monitored farms were selected based on survey data collected. Hence, 15% of farms having crossbred dairy cows in mid stage of lactation (parity of 2–5) were purposively selected from production systems and across herd size category. Totally 18(2production systems*3 farm sizes *3 replicates) farms were monitored. The two production systems were urban and peri-urban, while the three farm sizes were, small, medium and large and each was replicated three times. Questioner survey data collected were analyzed using SPSS and monitored data using GLM of SAS. Dairy farming has been gradually expanding in the areas. Hired laborers were employed for mpst farms activities. Average crossbred dairy herd per household was 10.6±2.1 in urban and11.3±2 in peri-urban, where, proportion of cows in herd was 46.3% and proportion of milking cows accounted for 76.7% in urban and 81.2% peri-urban of their respective total cows. Stall-feeding is the common practices of farms, mostly feeding hay, straw, wheat bran, Nug cake, and brewery waste. The overall milk yield was 9.9±0.1, it was significantly higher in peri-urban than urban farms. Cows in second and third parity had significantly higher in milk yield than those in fourth and fifth parity. Though statistically insignificant the overall mean figure for respective milk compositions of protein, fat, total solids, solids-not-fat and ash contents in urban farms were higher than peri-urban farms. The overall observed productive performance of cows were good but relatively inferior performance and prominent management problems were observed in medium sized farms.

Keywords: productive, urban, peri-urban, milk yield, milk composition

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INTRODUCTION

Dairy production is an important part of livestock production system in Ethiopian. The country has a huge potential to be one of the key countries in dairy production for various reason (Pratt *et al*., 2008). These includes a large population of cows in the country, a conducive and relatively disease free agro-ecology in the

mixed-crop livestock systems areas in highlands that can support crossbred and pure dairy breeds of cows (Ahmed *et al*., 2003), a huge potential for production of high quality feeds under rain fed and irrigated condition, existence of a relatively large population with a long tradition of consuming milk and milk products and hence a potentially large market (Holloway *et al*., 2000) existence of relatively cheap labor forces and opportunity for export to neighboring countries.

Despite the existing high potential for dairy development, the performance of the dairy industry in Ethiopia has not been encouraging when evaluated against the dairy performance of Eastern African countries (Alemu *et al*., 1998). The current milk production per annum of the country is very low, which has been estimated to be 3.2 million ton and growing at a rate of only 2.6% per year (FAO, 2007; CSA, 2008). Similarly human population in Ethiopia increases at a rate of 2.6% per annum (CSA, 2007), while the urban population increases at a rate of 3.8 percent per annum (UNICEF, 2009) and by the year 2015 it is expected to shoot up to a total growth rate of 22% for urban and 11% for rural population (Getachew and Gashaw, 2001). The projected urban-market for liquid milk in 2015 has been estimated at 60 million liters. Supplying this quantity of fluid milk from domestic production in Ethiopia would require an increase in production of

over 35 million litres in order to provide the Increased market requirements resulting from growth of urban population and increased consumer incomes. Moreover, the potential market for surplus milk which will have to be processed is found in 7% urban population (CSO, 2005 as cited by SNV, 2008).

Currently, the emerging and fast growing peri urban dairy production system operating at different levels of intensification is becoming one of the most important suppliers of milk and milk products to urban centre's where consumption of milk and milk products is remarkably high and offers important income opportunities for smallholders in Ethiopia(Yoseph,1999). The large demand supply variation in milk, with a possible increase in the purchasing power of people may show the potential and opportunity for development of peri urban dairy production systems in the country (Azage and Alemu, 1997). The potential role of this system in meeting current and future consumer needs is recognized as vital to the development of dairying in Ethiopia. To make the contribution more effective, input-output relationship is used as a yardstick to measure the efficiency of the production system (ILRI, 1996). Due to variation in input level and its utilization milk production and productive performance of cow were challenged in the sector.

Sebeta Awas wereda is one of the major suppliers of milk and milk products to Addis Ababa city. There are numerous dairy farms in the area, which ranges from small to large-scale and most of them keep crossbred dairy cows. Previous study mainly considered limited number of large sized farms of the present study area as one component of Addis Ababa milk shed (Yoseph, 1999). Whereas the smallholders, whose contribution has a great role to gross milk production has not been well addressed. Moreover, dairy farms are heterogeneous in terms of resources they own such as land, capital, feed, knowledge of farm owner, objectives of dairy raising and herd number they kept, hence, it is inevitable to bring difference in milk production and general farm managements. These differences makes different in the problems encountered during the production. Therefore, it is necessary to evaluate the current milk production status of small dairy farms as well as large farms operating under peri-urban and urban levels in devising appropriate development interventions. Hence, this study was expected to provide up to date baseline information and identify the main constraints that influence the urban and peri urban dairy production systems in Sebeta Awas Wereda.

Therefore, this study was aimed at evaluating the productive performance of dairy cows in urban and peri urban dairy systems of Sebeta Awas Wereda.

Specific objectives of the study was: to evaluate productive performances of crossbred dairy cows in urban and peri-urban dairy systems of Sebeta Awas Wereda.

MATERIALS AND METHOD

Description of the Study Area

The study was conducted in Sebeta Awas Wereda, particularly in and around Sebeta town, which was formerly called Alemgena wereda. The wereda is located between 24 and 45 km south west of the capital city, Addis Ababa, in Oromia Region, central Ethiopia. It is situated at latitude 8°55′N 38°37′E and longitude 8.917°N 38.617°E. It has an area of 87,532hectare. The livestock population of the wereda is estimated to be 45,0655 cattle; 74,115 sheep; 62,097 goats, 71,101 chicken, 77,927 donkeys,14,990 horses and 7,344 mules Sebeta Awas Wereda Rural and Agricultural Development Office(SAWRADO,2010).The total number of dairy cows in the wereda is 36,304, which 34,008(93.7%) are indigenous and 2,296 (6.3%) are crossbreds cows. The production system is mainly mixed crop livestock production systems. Intensive and semiintensive dairy production systems are mainly practiced by crossbred cattle owners in the wereda.

Sampling methods for questioners

Based on relative distances from the centre of the town

and farm land size, two major dairy production systems were identified in the area: urban farms, those farms which are located within the town, and peri-urban dairy farms, those farms which are located in the periphery of the town (about 3 km out of the town). In general, this study considered those farms which were located at a distance of 3 km and farther as peri-urban, while those farms located within three km radius were considered as urban. Accordingly, the study area was stratified in to urban and peri-urban production system. Each production system was further stratified into three based on herd size: small holders (farms with less than three cows), medium level (farms with 3-10 cows) and large scale (farms with greater than 10 cows) as suggested by ILRI (1996) and cited by Yoseph (1999). A total of 120 farms, 20 from each herd size of both production systems (20*3=60 from urban and 20*3=60 from peri urban) were selected for survey following stratified random sampling methods. Semi structured questionnaire was prepared for data collection and pretested before commencement of the actual survey(ILCA, 1990). Information on Household characteristics: such as age, sex, family size, educational background and purpose of dairy cow rearing, establishment time and herd composition of farms which includes cattle type and number, age and sex of dairy cattle, type of feed and feeding practices were gathered by interviewing the household heads or persons directly responsible for handling of animals and making decisions.

Sampling methods for monitoring

For the monitoring study, selection of farms was based on the survey of questioner's information. Hence, 15% of the farms, with crossbred dairy cows at mid stage of lactation (parity ranged from 2–5) were selected purposively from both production systems and across the entire herd sizes category. The total number of farms monitored were 18(3farms*3herdsizes*2 production systems).Monitoring was held for three consecutive months.

Monitoring milk yield performance of cows

Milk yield was recorded once a week for a period of three months. It was recorded for individual animals both in the morning and evening milking and the sum of which was taken as the individual milk yield per cow per day.

Body condition score and body weight measurement of cows

Heart girth of milking cows used for monitoring was measured, in the morning before feed was offered, at two weeks interval using a plastic measuring tape for three months. Body weight of the cow was estimated from heart girth measurement using the following formula

$$\mathbf{Y= 4.833697X – 423.405235 (R^2=0.86; CV=10\%)}$$

Where Y= estimated body weight in kg
X= heart girth in cm
The regression equation was developed at ILRI (Yoseph, 1999) Debrezeit station using the body measurement (heart girth) and actual weight of crossbred dairy cows.
Body condition of cows was scored on scale of 1-5(Edmo ndson *et al*., 1989) where 1= emaciated, 5= over conditio ning and determined concurrently with the weight estimate of the cows.

Milk sampling and chemical analysis

A total of 18 dairy farms, 9 from urban and 9 from peri-urban farms (three from each herd size groups), where a single cow in mid stage of lactation from each farm was used for milk sample collection. For three months, two hundred ml milk samples were collected from each household once at two weeks interval from morning and afternoon milk for chemical analysis. Immediately after milking and thorough mixing, milk sample was taken from each animal. Each milk sample of morning and afternoon was placed in sterile bottles of 100 ml capacity having 5mg potassium dichromate. The milk samples were kept in a refrigerator at 4ºC over night before transportation with an ice box to Holeta Research Center Dairy Laboratory. In laboratory morning and afternoon milk samples of each cow was pooled and chemical analysis for milk compositions were done following standard laboratory protocol.

Statistical Analysis

Both quantitative and qualitative data collected during the survey were analyzed using Statistical Package for Social Sciences version 16 (SPSS, 2008). Descriptive statistics such as means, percentages, standard deviations, standard error of mean and frequency distributions were used to describe the various variables in the production systems. General Linear Model (GLM) procedure of SAS (2008) was used for analyzing those monitored data stratified into production systems and herd size. Mean comparison was done using the Least Significant Difference (LSD) for variables whose F values showed a significant difference. Differences were considered statistically significant at 5% level of significance.

Model for productive performance of cows

Data on productive and reproductive performance of

Table 1. Gender and educational status of households in Sebeta Awas Weredas

	Urban farms			Peri urban farms			
Variables	Small N=24	Medium N=28	Large N=8	Small N=22	Medium N=28	Large N=10	Overall N=120
Gender of household head (%)							
Male	64.7	75	66.7	70.6	71.4	78.6	71.7
Female	35.3	25	33.3	29.4	28.6	21.4	28.3
Education status of household (%)							
Illiterate	0	6.3	16.7	5.5	14.3	7.14	8.3
Read and write only	6.3	15.6	16.7	16.7	3.6	14.3	11.7
Primary school level (1to 6)	12.5	6.3	8.3	27.8	10.7	7.1	11.7
Junior school level (7 to 8)	25	3.1	0	0	3.6	0	5
Secondary school level	25	40.6	33.3	44.4	42.9	28.6	36.7
Certificate and diploma level	18.3	18.8	33.3	0	17.9	14.3	16.7
Degree (Bsc) level and above	12.5	9.4	0	5.5	7.1	28.6	10

N=number of farms

crossbred dairy cows was analyzed using the following model.

$Yijkl= \mu + A_i + Bj + (AxB)ij + C_k + D_l + eijkl$

Yijkl=Response variable

μ= overall mean

Ai= fixed effect of the i^{th} production system

Bj= fixed effect of j^{th} herd size

(AxB)ij=interaction effect of production system and different herd size

C_k=fixed effect of parity

D_l=fixed effect of genotype

eijkl= random error

RESULTS AND DISCUSSION

Household Characterization

Gender and education level of Dairy cow households in wereda

Gender and educational status of households in urban an d peri-urban dairy production systems in Sebeta Awas Wereda is indicated in Table 1. Out of the total interviewed household heads, 71.7 % were male, while 28.3% were female-headed households. Among the different herd sizes considered large sized farms in urban areas were largely managed by male headed-households. On the other hand, the largest proportion of female- headed households was recorded in small and large sized urban farms. This finding is in agreement with what has been reported for Mekelle, which was 27% for female-headed(Negussie,2006) but slightly higher than what has been reported for Addis Abeb (24.1%), (Yoseph *et al*.,2003), Awassa (23.3 %) (Ike, 2002) and Bahir Dar and Gonder (23%) (Yitaye, 2008). This indicates that women involvement in dairy sector play an important role in the study area. The high percent of female-headed households in the present study was due to better access for market to sell milk and encouraging opportunity of credit services from different micro finance institutes.

With regard to education, about 81.3% of the household heads had gone through the formal primary and above primary level of education, while 11.7% of were limited to informal education which enabled them to read only. The result obtained is comparable with what has been reported for Addis Ababa milk shade where 78%of the households were literate (Yoseph et al., 2003) and that of Shashamene Dila (Sintayehu et al., 2008) where the proportion of overall illiterate farmers was 19% but greater than what has been reported for Mekelle (73.5 % literate) (Negussie, 2006). In the current study, since most of the dairy farm holders are literate, it is easy to address dairy production improvement strategies through good extension and training programs.

Family size and age distribution

Family size and age distribution of households in urban and peri-urban dairy production systems is shown in Table 2. The average family size per household in urban and peri-urban areas was 5.95+ 2.6 and 6.52 + 2.9, respectively with an overall mean of 6.23+ 2.74 persons per family. There was larger family size in peri-urban farms, which might be associated with the labour requirement for various farm activities in the areas. The

Table 2. Family size and age distribution of interviewed households in Sebeta Awas Wereda

Variables	Urban(N=60) Mean ± SD	Peri-urban(N=60) Mean ± SD	Overall(N=120) Mean ± SD
Family size	5.95± 2.613	6.52 ± 2.855	6.23± 2.74
Age distribution (%)			
20-35 years old	13.95	17.65	15
36-50 years old	32.56	41.18	35
51-65 years old	44.19	41.18	43
66-80 years old	6.98	5.88	7

N= number of farms

Table 3. Shows occupational status of households in urban and peri-urban farms of wereda

	urban farms			peri-urban farms			
variables	Small	medium	large	small	medium	Large	Overall
Occupation (%)							
Housewife	25	15.6	8.3	22.2	10.7	21.4	16.7
Business man	12.5	25	25	16.7	25	7.1	20
Dairy cow raiser	12.4	15.6	8.3	5.6	10.7	28.6	13.3
Farmer	25	18.8	16.7	27.8	7.1	7.1	13.7
Government employee	18.8	21.9	8.3	22.2	32.1	14.3	21.7
Investor	0	0	0	0	0	7.1	5.7
Retired personnel's	6.3	3.1	25	5.6	3.6	0	1.7
Student	0	0	8.3	0	10.7	14.3	5.0

N= number of farms

average family size observed in this study is less than the value reported by Ike et al. (2005) who showed that the average family size for urban and peri-urban dairy farmers in Awassa was 7.55± 2.92 and 8.64 ± 2.70,respectively. Higher result was also reported from Shashamene Dila area, where urban family size was 7.19 ± 0.26(Sintayehu et al., 2008). Study result in West Shoa Zone indicated slightly higher family size per household, with an overall mean of 7.11±2.02 persons (Deresse, 2008).

The distribution of age along the different age groups varied within the three-farm categories. In both production systems, highest numbers of the respondents were found in the age group of 51–65 years and 36–50 years whereas the lowest number of respondents found in the age groups of 66-80 years. The overall mean age of respondents was 48.78 ± 1.086 years with an average age of 49.21 1.667 years in small, 46.21 1.55 years in medium and 52.92 2.636 years in large sampled farms. The smallest mean age of respondents was found in medium farms. As the mean age of respondents indicated, most dairy cow owners were adults in their late forties. Negussie (2006) indicated that the overall mean age of respondents' in Mekelle was 51.35 ± 1.01 years with an average age of 51.01 1.17 years in small, 51.3 2.38 years in medium and 56 3.19 years in large sampled farms which is slightly greater than the present result. Higher percentage (63.2) of respondents was reported for the age groups between 25-50 years in Shashamene-Dila areas (Sintayehu et al., 2008). In general, fifty percent of the respondents' age was in between 20- 50 years old, the other 43% were between 51-65 years old. From the results it can be deduced that most of the respondents were in their productive age's category.

Occupation of the households

The occupational status of household in urban and peri-urban production systems is shown in Table 3. Most of the crossbred dairy farmers were government employees (21.7%),business men (20%) and housewife (16.7%) the remaining were dominantly farmers and dairy cow raisers. This indicates that the crossbred dairy farming is commonly run by educated and middle income groups. The less involvement of farmers in the venture was probably due to the high price of cross bred heifers and cows, which was probably unaffordable for most farmers.

Division of labour

The percentage share of family and hired labour in activities of dairy farm is indicated in Table 4. In general, most of the activities related to dairying in small sized

Table 4. Percentage of labour division in urban and peri-urban farms of Sebeta Awas Wereda

Farm activities	Urban			Peri-urban			Overall
	Small N=24	Medium N=28	Large N=8	Small N=22	Medium N=28	Large N=10	N=120
Herd managing &selling milk (%)							
By family	48.6	33.9	26.7	75	28	12.5	37.5
By hired laborer	51.4	66.1	73.3	25	72	87.5	62.6
Selling cows (%)							
Owner	100	100	85.3	100	100	85.3	95.2
Manager	0	0	14.3	0		14.3	4.8

N=Number of farms

Table 5. Establishment ages of urban and peri-urban dairy farms in Sebeta Awas Wereda

	Urban (%)	Peri-urban (%)	Overall (%)
Farm age (%)	N=60	N=60	N=120
1-5 years	54.76	52.63	54.1
6-10years	28.57	21.05	26.2
11-15years	7.14	15.79	9.8
>16 years	9.52	10.53	9.8

N=number of interviewed household

farms were done by the family members. Majority of large (80.2%) and medium (73.6 %) sized farms use hired labour to run thier dairy activities. This figure is comparable to the urban dairying reported for Mekele town, where the involvement of hired labour goes as high as 75.7% in large and medium-scale farms (Negussie, 2006) but lower results (5 to 11.7%) were reported in Shashamene-Dila area (Sintayehu *et al*., 2008). Across all small and medium-sized farms purchasing and selling of cows was done by the farm owner but there were cases in large farms, where employed managers (14.3%) take part in these activities. In most urban farms, the proportion of hired labour was somehow higher than that of peri-urban farms. Relative to small and medium sized farms, majority of urban and peri-urban large farm activities were done by hired labour. Almost equal proportion of hired labour and family member was involved in small urban farms but less proportion of employed labour involved in peri-urban small farms. Among the total number of farms considered, 62.5 % of dairy farm activities in the study area were done by hired labour. The high percentage involvement of hired labour was probably related to the more frequent engagement of the owners in off-farm activities such as government job, trading (businessmen) and private work, as indicated above.

Establishment time of farms

The time of establishment of dairy farms in urban and peri-urban dairy production systems in Sebet Awas Wereda is shown in Table 5. The overall age of dairy farms indicated that most of them were established recently.Only 9.8% of farms were established before sixteen years agoAbout 83% and74% of the urban and peri urban farms were established over the last 10yearsrespectively.This revealed that there is an increment in milk production due to the gradual expansion of dairy farms in the urban and peri urban areas. Similarly, Mekonnen et al. (2005) indicated that 51% of smallholder dairy farms near Addis Ababa had less than six years of age. Lower percentage than the current results were reported by Sintayehu et al. (2008) for urban dairy farms in Shashamene Dila area,where dairy farms were established during the last six years

Herd composition of crossbred dairy herds of Sebeta Awas Wereda

The average herd size owned per household in urban and peri-urban crossbred dairy production systems is shown in Table 6. In this study, the overall average herd size of crossbred dairy herds per household was 10.6+2.1 in urban and 11.3+2.0 in peri-urban areas.

Table 6. Number, percent and Mean±SE of crossbred herd composition of dairy farm of Weredas

Variables	Urban					Peri-urban				
No of respondents	Small N=24	Medium N=28	Large N=8	Total N=60	Mean±SE	Small N=23	Medium N=27	Large N=10	Total N=60	Mean±SE
Milking cows	n	n	n	n (%)		n	n	n	n (%)	
Pregnant	10	40	29	79(33.5)	1.3±0.1	17	45	61	123(35.2)	2.0±0.4
Non-pregnant	20	44	38	102(43.2)	3.7±1.1	14	56	91	161(46)	1.6±0.2
Dry cows										
Pregnant	9	16	8	33(14)	0.5±0.1	5	22	13	40(11.4)	0.6±0.1
Non pregnant	1	14	7	22(9.3)	0.3±0.1	2	11	13	26(7.4)	0.4±0.1
Total cows	**40**	**114**	**85**	**236**		**38**	**134**	**178**	**350**	
Heifer (2-3 yrs)										
Pregnant	10	30	21	61	1.0±0.1	5	18	41	64	1.2 ±0.1
Non-pregnant	1	29	16	46	0.7±0.1	3	19	34	56	1.0±0.2
Heifer(up to2 yr)	**19**	**86**	**53**	**159**	**2.7±0.5**	**21**	**67**	**153**	**241**	**4.1±0.8**
Male calves	1	12	12	25	0.4±0.0	1	16	11	28	0.4±0.1
Total	71	272	184	**527**	**10.6±2.1**	68	254	417	**739**	**11.3±2.0**

N= Number of respondents'; n=number of herds in farms SE= standard error

Almost similar result was reported in Bahir Dar and Gonder areas where the average herd size per household was 11 cows per urban farm (Yitaye, 2008).Lower herd size of 6.85 ±5.837 and 4.68 ± 3.89 was reported in urban and peri urban farms of Awassa andWest Shoa zone,respectively (Ike et al.,2005)and Deresse,2008).Lower herd size of 4 per farm was also reported around Addis Ababa(Mekonnen et al., 2005). The proportion of cows in the total herd in the current study is 46.3 percent. This result is lower than 50% reported for urban and peri urban dairy farms in Addis Ababa milk shed (Yoseph et al., 2002). The overall proportion of milking cows accounted for 76.7 and 81.2% of the total cows in the herd of urban and peri urban farms, respectively indicating that slightly higher proportion of productive cows were held in both cases. Distributions of cows on their productive state showed that among the total number of cows in urban farms 33.5% were pregnant and milked, 43.2% were milked and non-pregnant, 14%were dry and pregnant and 9.3% were dry and non-pregnant while, the values in peri urban farms were 35.2% pregnant and milked, 46% milked and non pregnant, 11.4%dry pregnant and 7.4% were dry and non pregnant. In both cases, highest numbers of cows were non pregnant and lactating. There was a deviation of 8.5% in urban and 7.7% in peri urban farms below target value of pregnant milking cows. Of dry pregnant cows, there was also 4.09% deviation below the target value (17%) a set by Radostits et al, 1994 and Hoffman, 1999 in Table 3. Higher percent of cows were reported in urban(9.3%) than peri urban(7.4%) farms that were kept dry and non pregnant, which requires extra expense for their feeding and other management aspects. This suggests the existence of reproductive management problem in the farms, letting an unnecessary expense which is uneconomical. Male animals were few in number compare to female animals in both urban and peri urban dairy farms of the study area. This indicates that cattle are predominantly kept for milk production to obtain income through sale of milk and milk products. Relatively larger percentage of dry non pregnant cows are observed in large and medium sized farms compared to small sized farms of present study. Comparatively less milking cows were kept in West Shoa Zone(Deresse,2008)that is, 71.8% and 67.5% of the total cows in the herd in urban and peri urban farms, respectively. Similarly, Kurtu et al. (2003) reporter that larger percentage of dry and non pregnant cows were recorded in large and specialized farms of the Harar milk shed. Earlier works by Hoffman (1999) reported values of 21% pregnant lactating cows, 21% non pregnant milking cows, 18% dry pregnant cows and 9% dry non pregnant cows in Addis Ababa milk shed. Where comparatively, the current study shows a lower number of dry non pregnant cows, owing to better awareness and improved reproductive management provided to the cows in the study area. Kurtu et al.(2003) reported a total of 76% lactating cows and 24% dry cows were found in Harar milk shed. Hoffman(1999) also reported that there were42% lactating and 27% dry cows in urban and peri urban dairy farms of Addis Ababa.The results of the present study indicated higher percentage for urban(76.7%)and peri urban(81.2%) lactating cows and lower percentage of dry cows than that of Harar Milk Shed and the reports for Addis Ababa.

Table 7. Feeding system and main feed types of Sebeta Awas Wereda

Variables	Urban			Peri-urban			
	Small N=24	Medium N=28	Large N=8	Small N=23	Medium N=27	Large N=10	Overall N=120
Feeding systems (% Farms)							
Stall feeding or zero grazing	100	93.6	100	100	92.3	80	94.3
Semi (intensive)grazing	-	6.5	-	-	7.7	20	5.7
Main feed types (%Farms)							
Grazing/ Foraging	1.5	1.7	-	6.1	2.1	-	1.9
Hay	20.9	21.7	32	24.2	22.1	19.4	20.4
Green feed (grass, legume trees tree lucern, elephant grass, sesbania)	4.5	2.6	-	3.0	2.1	6.5	3.1
Crop residue (wheat straw)	14.9	20	8	19.7	21.0	19.4	17.2
Concentrate (Beas & peas coat, oil seed cakes, wheat bran, brewery spent grain and molasses)	20.9	22.6	28	25.8	24.2	25.8	24.6
Mineral supplement(Common salt bole)	19.4	15.7	32	12.2	15.8	16.1	18.2
Non conventional feeds (local liquor residue, vegetable & fruit waste leave	17.9	15.7	-	9.1	12.6	12.9	11.4
Coping means of feed shortage (%)							
Reduce herd size	43.7	25	33.3	33.3	35.7	-	28.5
Purchase additional feeds	56.3	75	66.7	66.7	64.3	100	71.5

N= number of farm household interviewed

Feed Resources and Feeding of Herds

Commonly used feeds in urban and Peri-urban dairy farms of Sebeta Awas wereda is given in Table 7. The major feed sources for dairy cattle in the study area included purchased grass, natural pasture, conserved forage (hay), crop residue, by-product of local beverage, brewery waste and agro-industrial by-products (wheat bran, oil seed cake, flour mill scraps). Majority of the respondents in urban and peri-urban dairy farms in the study area use combinations of different feed resources based on availability. In most of t he urban and peri-urban farms, in overall the feeding syst em was stall-feeding (zero grazing) (94.3%) and the rest(5.7%) use semi-grazing. However there were some urban(6.5%) and peri urban(7.7%)medium farms and peri urban large farms (20%) which used semi-grazing system. This result agreed with the report by Ike *et al*. (2005) where 95 percent of dairy farms in the urban and 92.1 percent of peri-urban farms use zero grazing and semi grazing in and around A wassa areas. Similarly, studies conducted on urban and peri-urban dairy production in central Ethiopia have report ed semi-zero road side and public open field grazing as a source offered (Stall ad Shapiro,1996;Yoseph,1999). This indicates that there is shortage of land in urban and even in peri urban areas for the production of natural pasture and for grazing purpose because of shortage of land and above all majority of the crossbred dairy cow holder were not farmer. Some estim ate reported that there could be about 14 million tones of crop residues and 500,000 tonnes of agro-industrial bypr oduct produced annually in Ethiopia (EARO,2003). From Bishoftu, Mojo and Adama areas teff straw and hay were

Table 8. Body weights and body condition score of dairy cows in farms the Wereda

Parameters	Body weight (kg)		BCS	
	N	LSM±SE	N	LSM±SE
Overall	18	482.5±10.5	18	2.89± 0.63
Production system		*		NS
Urban	9	443.5±11.6^{b}	9	3.13±0.07
Peri-urban	9	508.0±12.9^{a}	9	3.13±0.09
Herd size		NS		**
Small	6	476.6±10.4	6	3.11±0.1^{ab}
Medium	6	467.3±22.5	6	2.97±0.1^{b}
Large	6	488.1±21.9	6	3.39±0.1^{a}
Blood level		NS		NS
62.5%	8	463.1±16.9	8	3.06±11.4
75%	10	491.6 ±11.7	10	3.18±10.1
Parity		NS		*
2	8	488.6±20.3	8	3.34±13.7^{a}
3	6	479.0±17.4	6	3.24±14.5^{a}
4	2	474.1±8.8	2	2.49±10.2^{b}
5	2	474.5±22.9	2	2.48±14.5^{b}
		P < 0.05		P<0.05

LSM= Least square means; N = number of farms and a single cow per farms; SE=Standard error, NS= non-significant (P>0.05), * Significant (P< 0.05) and **= highly significant (P<0.01), BSC= body condition score, the means were compared across the columns.

exported to Djibouti used for feed purpose in quarantine station which aggravates the feed shortage problem. Wheat & barely straw were saved from export due to their difficulty in bailing and less preference for fattening (Berhanu *et al*., 2009). Since the problem of feed shortage was inevitable to be, the dairy holder followed different coping ways. Of the ov erall, 28.52% of the respondent followed reductions of the herd numbers in coping with feed shortage and expensiv eness, remaining 71.48% sustain their farm with the expe nse of money for expensive feeds.

Body Weight and Condition Score of Dairy Cows

Body condition score and estimated body weight of crossbred dairy cows in urban and peri-urban farms are given in Table 8. The result showed that the body condition of cows across all the farm scale was within the normal ranges. Whereas least significance difference of mean indicated that large farms were significantly better in condition than that of the medium and smaller one. Body condition score was also affected by parity of cow where those cows in parity two and three had significantly better in condition than that of four and five. Moreover, cows in parity four and five were lower than the recommended level (2.5 to 3.5)(Richard and Jeffrey, 1993). Those cows in the peri-urban farms were significantly heavier than that of urban farms. As numerical figure indicated cows in large farms were heavier than those in medium farms. The present study is in agreement with that of Fayo(2006) who reported that cows in large farms were significantly heavier(520+10.36kg) than those in medium farms(476+11.89kg). Higher body weights were observed in large farms followed by small farms. In the present study across all farms body weight of cows were much heavier than the value 403.7+ 36.48 kg reported by Yoseph(1999) for crossbred cows in Addis Ababa. The higher body weight is probably due to increase of exotic gene level and better management

Milk yield of Cows in Urban and Peri- urban farms

The overall mean (SD) daily milk yields of urban and peri-urban dairy farms are showed in Table 9. The result showed that, the overall average daily milk yield of

Table 9. Least square means of daily milk yield of crossbred dairy cows in Wereda

parameters	N	Milk yield(LSM±SE)liters
Overall	18	9.9±0.1
Production system		**
urban	9	10.19±0.61[b]
Peri-urban	9	10.65±0.52[a]
Herd size		NS
Small	6	10.54±0.73
Medium	6	10.44±0.99
Large	6	10.27±0.64
Blood level		NS
62.5%	8	9.81±0.79
75%	10	10.9±0.61
Parity		**
2	8	10.87±0.70[a]
3	6	10.50±0.77[a]
4	2	9.38±0.75[b]
5	2	8.74±2.7[b]
p		<0.001

N = number of monitored cows in farms; SE= standard error, NS = non-significant (P> 0.05), * = significant (P< 0.05) and **= highly significant (P<0.01); LSM= least square mean, the mean values were compared in columns

Table 10. Chemical composition (Mean±SD) of milk of crossbred cows of urban & peri-urban farms

	Urban				Peri-urban				
variables	Small	Medium	Large	Ur- total	Small	Medium	Large	Peri-ur-total	Overall
Protein%	2.98±0.3	2.77±0.2	2.87±0.3	2.67±0.3	2.77±0.6	2.66±0.5	2.57±0.4	2.67±0.5	2.78±0.4
Fat%	4.68±1.6	4.37±0.8	4.68±1.3	4.58±1.2	4.21±0.9	3.99±0.8	4.12±0.7	4.1±0.8	4.34±1.0
Total solid%	13.47±1.9	13.28±1.3	12.87±1.5	13.2±1.6	13.19±1.4	12.1±1.9	12.6±1.3	12.63±1.5	12.92±1.6
Solid not fat%	8.81±2.1	8.91±1.5	8.19±1.1	8.63±1.6	8.53±1.9	7.62±1.7	8.48±0.9	8.21±1.6	8.42±1.6
Ash%	0.62±0.1	0.57±0.1	0.57±0.1	0.59±0.1	0.61±0.1	0.61±0.1	0.58±0.1	0.6+0.1	0.59+0.1

SD=standard deviation; N=number of cows selected from different herd size farms; ur-total=urban total; Peri-urb total peri-urban total

crossbred dairy cows was 9.91+0.13 litres per cow per day. Analysis of variance showed that milk yield was significantly different among production systems and parity Table 10. Mean comparison using LSD indicate that peri urban farms had significantly higher milk yield than urban farms. Least square mean comparison showed that parity of dairy cows significantly affected the daily milk yield. Hence, those cows in their second and third parity produce significantly higher yield than cows in fourth and fifth parity. Exotic gene level of cow didn't significantly affect milk yield but there was numerical difference among the groups and those cows of high exotic gene level produced higher milk yield than other with lower exotic gene level. The interaction between the production system and herd size showed significant difference in milk yield; those medium and small farms in peri urban areas had significantly higher milk yield than their urban counterparts. Similar results were reported for dairy cows in the urban system of Shashamene Dila area where, milk yield per day were ranged from10.2±1.59 to 15.90±2.36 litres (Sintayehu et al., 2008).Previous report showed that the average milk yield in large peri urban farms was 8.92 liters, which is lower than the present values (Yoseph,1999). The present result is higher value reported in North Western part of the country, where 8.3 and 7.3liters of milk were reported for urban and peri urban farms, respectively (Yitaye, 2008).In general, earlier works conducted in different tropical countries regarding milk production included a wide range of observations on crossbreds of Holstein Friesian breed.

The daily milk yield in the present study was lower compared to the values reported in tropical areas. Singh et al.(1989) found a mean daily milk of 14.4 kg/day in Holstein Friesian cows in India. Orelas et al.(1981) also observed a mean of 15 kg daily milk yield in Mexico for Holstein Friesian cows. Combellas (1980) after analyzing large amount of lactation records of Holstein Friesian cross cows reported that the cows had an average daily milk yield of 13.8 kg in Australia. The difference in milk yield among the different reports might be due to difference in blood level, management, feeding and other environmental factors.

Milk composition

Milk composition of dairy cows in urban and peri urban dairy farms in Sebeta Awas Wereda is presented in Table 10. The overall average percentage composition of protein, fat, total solids, solids-not-fat and ash contents in urban farms were 2.88±0.27%, 4.58±1.21%, 13.20±1.56%**,** 8.63±1.60% and 0.59±0.09% respectively. While, the overall average percentage of composition of protein, fat, total solids, solids-not-fat and ash contents in peri-urban farms were 2.67±0.47%, 4.10±0.77%, 12.63±1.53%**,** 8.21±1.61% and 0.60±0.08% respectively. The average protein, fat, total solids and solids-not-fat of milk in urban farms were higher than peri-urban farms, however, the mean ash content observed in this study was nearly equal for both urban and peri urban farms. Similar results were reported from West Shoa Zone for fat (4.27%), total solid (13.07%), solid Not fat (8.89%) but values of protein (3.67%) and ash (0.70%) were higher than the present study (Deresse, 2008). Relatively lower percentage for fat and total solid and high percentage for protein than the present result were reported by Yoseph(1999). Analysis of variance showed non-significant difference in protein, fat, total solids, solids-not-fat and ash contents between the production systems or the interaction between production systems and different herd size. This implies that milk composition was not influenced by any one of the fixed effects in the study area. Unlike the current study, in a previous study significant variation in fat and total solids contents were observed for milk samples collected from crossbred dairy cows with different herd sizes in Addis Ababa milk shed (Yoseph *et al.*, 2003). This might be due to the effects of urbanization which occupies the then grazing land through residential homes, which forced dairy farmers to depend on purchased feed of same origin. The lack of significant effects (P> 0.05) in protein, fat, TS, SNF and ash contents for all the factors considered might be due to the feeds and feeding in the area shared common ingredient of feed stuff. Higher (Mean ±SD) values were observed in both urban and peri-urban small size farms than their respective medium and large size farms for protein, fat, total solids percentages. Almost similar results were observed between medium and large farms of same production systems.

CONCLUSION

Performance evaluation of crossbred dairy cows is very vital in identifying the areas required for interventions for progressive improvements of the dairy sector. An increase in overall milk production of the area was observed and this could be due to the gradual expansion of dairy farms, where above 54% of the farms were established in the past 5years. Moreover, the overall proportions of cows in the total herd were 46.3% while that of milking cows accounted for 76.7 and 81.2% of the total cows in the herd of urban and peri-urban farms, respectively showing that cows were kept mainly for milk production. Body condition of cows across all the farm was within the normal ranges, though large farms and cows in parity two and three were significantly better in condition than medium & smaller one and as well that of fourth and fifth parity respectively.The overall daily milk yield was 9.9+0.1liters, where peri urban dairy production system had significantly higher milk yield than urban production system. Milk yield was also affected by parity level where cows in second and third parity had significantly higher milk yield than those in fourth and fifth parity.The overall composition of milk in urban was greater than the respective peri urban farms, while that of ash slightly greater in peri urban farms than the urban farms. There was no significant difference for milk compositions between production systems, across the different herd sized farms and the interaction between them. The hygienic quality or microbial quality of milk was not addressed in the current study of this wereda, it needs to be further investigated.

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