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Effect of Feed Sources and Feeding System on Milk Production and Marketing in the Babille District of East Hararghe Zone, Ethiopia

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Abstract

The aim of this article is to presents findings of research investigating the impact of feed sources and feeding system on milk production and milk marketing in the Babille district of Eastern Hararghe zone. Data were collected using a structured questionnaire which was administered to 152 randomly selected sample dairy cow keepers in the district. Data was analyzed using descriptive analysis and regression analysis. Data from regression analysis demonstrated that the different factors had a different effect on the milk produced. The factors with strongest influence on the milk yield were dry fodder, green fodder, labor and number of cows. Feed is set to remain the most important and manageable component of commercial livestock production. Results clearly show that, in addition to dry fodder, the green fodder obtained through thinning of sorghum and maize highly affects milk production positively. Hence, ways of integrating cereal production with dairy production and efficient utilization of existing feed sources should be needed. So if energy dense sources of feed is adopted for the dairy producers in the study area, they may diversify their feed sources and could lessen risk related livestock feed and livelihood. The cost of feeds and unimproved feeding system is also constraint in livestock production of the study area.

Keywords:
Feed sources, Feeding system, Milk production, Milk Marketing, Ethiopia

1. Introduction

In Ethiopia, agriculture is the main economic activity with more than 80 % of the population depending on it which livestock play a very important role (CSA, 2014). Livestock is a crucial part of the agriculture sector, and the contribution of livestock and their products to the agriculture economy is 47 % (Birara and Zemen, 2016). Ethiopia holds the largest cattle population in Africa with an estimated herd of approximately 53.4 million head (CSA, 2015). Oromia with its current livestock population accounts about 40.4%, 32.8% and 28.2% of the country's cattle, sheep and goats population respectively (CSA, 2015). Apart from this large number of livestock population and its diversity, the benefit obtained from the sub-sector is low compared to other African countries. For instance, from analysis of five year, the world milk production increased by 150 million ton per year, though not enough to feed the current population (Teshager et al, 2013). Non-Africa countries accounted for approximately 85% of all milk volume growth from 2002 to 2007, whereas Africa contributes only 5% of the worlds milk production. Even though Ethiopia has largest cattle population in Africa, but the country is not among the four largest milk producing countries in Africa, namely: Egypt, Kenya, South Africa and the Sudan (Teshager et al, 2013). Among the livestock sector, dairy production is a critical issue in Ethiopia where dairy products are important sources of food and income. However, dairy production has not been fully exploited and promoted in the country and its production is also low compared to its potential. Direct contribution of dairy production to the national economy is limited. One possible explanation is that the dairy sector is not developed to the expected level. The annual growth rate in milk production is 1.2 percent falls

behind the annual human population growth estimated at 3 percent (GRM, 2007).According to (FAO, 2014) between the periods 1993 - 2012 total annual milk production has been growing, but at a moderately slow rate. However, Nathaniel et al, (2014) argue that dairy inputs and services provisions are still at infant stage and the expansion of improved dairy cows is limited in the country, and hence the increase in milk production may have come mainly from increased number of cows rather than increased productivity. The low productivity is principally due to inefficient nutritional and management practices, low genetic potential of the indigenous cows, high level of disease and parasitic incidence, poor access to extension and credit services, and inadequate information to improve animal performance (Aynalem and Genene, 2011). Among these constraints, inadequate quantity and quality feed ingredients have been identified as a major limiting factor to the development of dairy production in rural and urban dairy systems (Belay et al, 2011). Several factors are attributable to the problem, but source of feed, inadequate quality of feed and feeding system are the most constraints and causes about 40 percent shortfall in to the livestock productivity (Land O'Lakes, 2010). In the study area, small-scale market-oriented dairy production is increasingly becoming popular for income generation, family nutrition and employment. This dairy system is contributing immensely towards filling in the large demand–supply gap of milk and milk products that are caused by population, income and urban growths. However, farmers in the study area ranked feed shortage as their first major constraint to dairy production (Belay et al, 2011). Understanding the sources of various feed resources and feeding system, and their impact on milk production and marketing used by farmers is important in order to identify appropriate research and development interventions to enhance sustainable health and performance of dairy cattle. However, there is no such work done in Babille district to plan technical and institutional interventions. The aim of this study was to identify the sources of available feed resources and feeding systems, and their impact on milk production and marketing under smallholder dairy system in Babille district, Oromia Regional State, Ethiopia.

2. Materials and methods

2.1. Description of the Study Area

This study was conducted in Babille District which is found in eastern Haraghe zone of Oromia National Regional State, Ethiopia. Babille is the name of the district as well as administrative center of the district which is located 35 km away from Harar town, capital of Harari Regional State and East Hararge zone. Having an area of 3022.2 km2, the district is characterized by warm lowland lying between 950 to 2,000m above sea level and situated between 80 9' – 90 23' N latitude and 420 15' – 420 53' E longitude with an elevation of 1200-1800 meters above sea level (Bedilu et al, 2014). The district has 21 'ganda' (smallest level of administrative unit) and 1 urban 'ganda'. From the district the study was undertaken in four 'ganda'named as: Ifaa, Erergуddaa, Ereribada and Tofiq (DoARD, 2015).The administrative town of the Babille district was also considered in the study. The district has an estimated total population of 94, 650 people of whom 56,198 are male and 48,452 are female (DoARD, 2014). Agricultural production is the main means of livelihoods in the district. The main crops produced in the area include maize, sorghum, groundnut, chat, sweet potatoes and pepper. The area allocated for crop production in 2014 was 20,710 ha. The study area has a huge potential in dairy production and livestock husbandry which is dominated by 56,355 cattle, 122,160 sheep, 23,020 goats, 9,704 camel, 7,181 donkey, 21,671 poultry (DoARD, 2014). The livelihoods of the people also depend on livestock production complemented with crops. According to evidence obtained from Babille District (DoARD, 2014), average milk production per year is about 3,470,776 liter and about 75% is used for market as income generation in the district.

2.2. Sampling procedure

The required sample size was determined according to the sampling formula provided by (Cochran, 1977), in drawing an adequate sample size from a given population at 5% error and 95% confidence level. The procedure is as follows:

$$n= Z^2 .p. q/e^2$$

Where: n = the required sample size to be drawn, Z = the desired confidence level (the value corresponding to the 95% i.e. 1.96), e = the desired level of precision (maximum margin of error i.e. 5%), and P estimated proportion (degree of variability) of an attribute that is present in the population. The total population of milk producing farmers having only local, crossbred and both in all 21 'ganda' and Babille town of the district was about 9,763 in which the size of milk producing farmers in the four sample 'ganda' and one administrative town is 11.1 percent and 1-p is about 88.9 percent. Therefore, the study used the procedure stated in the above equation to collect the primary data and to maintain sufficient sample size. Accordingly, a total of 152 milk producing households were randomly drawn using probability proportional to size (PPS).

2.3. Methods of data collection and analysis

Both primary and secondary data sources were used in the present study. The primary data were collected using structured questionnaire administered to households that were selected as representative sample from the study area. The data collected from milk producing households include characteristics of household; input used and milk production, feeding practices/system, sources of feed, supplied feed expenses and milk marketing. The collected data were analyzed using descriptive statistics and econometric models of regression analysis using STATA.

3. Results and discussion

3.1 Milk production

Results presented in Table 1 show the input and output variables that are used in the regression analysis. The average milk per cow per day is 2.58 and 6.69 liters for local and crossbred, respectively. The milk yield obtained from each breed is extremely different. The average milk yield per cow per year was 2,882.73 liters, and 1,216.22 liters from crossbred and local breed, respectively. The milk yield from crossbreed cow is 137% times higher than milk yield of local breed cow per year. This difference is attributed to not only breeds difference, but also source of feed and feeding system. The average number of milking cows per sampled household was about 2 (range of 1 to 6). The small number of milking cow per household may be an indication that households manage small size in view of environmental starvations. The average dry and green fodder supplied to the milking cows per sampled household per year is 1,494.01 kg and 1,526.09 kg, respectively. Whereas the average dry and green fodders, fed per cow per year, appeared to be 782.2 kg and 799 kg, respectively. More feed sources consumption goes to crossbred cows. According to the sampled household responses, crossbreds prefer concentrate feed; however, less availability of concentrate feed in study area. The average concentrate supplemented to the milking cows per year was 507.77 kg. But, the concentrates feed offered to crossbreed is greater by 133.9% of local cow. This indicates that those households owning crossbred cows have used concentrate feed.

The labor used for lactating cows per sample households per year includes involvements in milking, watering, barn cleaning, herding, feeding and taking care of sick cows. The respondents indicate that labor requirement is high for crossbred cows because of the cows need more feed and continuously feeding, watering (usually fetch water from the sources and water at home), and cleaning barn frequently (at least three times per day for cross breed cow). Milking is consuming time and has handled by male household members. The labor consumed by crossbred is about 55% times the labor consumed by local cow.

3.2. Regression analysis of milk output

The regression analysis shows that the relationships between variables, which could be determined as cause effect relationships. The testis designed for solution of general problems, the type of the relationship, to determine the function of the relationship and quantitative determination of functions parameters. The variable who sevariations must be explained or predicted, are called dependent variables. The purpose of regression analysis is to determine how and at what extent the dependent variables change or vary as a function of changes in the fixed variable (Gatev,K , et al, 1991).

The following regression equation is obtained:

$$Y = 0.70679*X1 + 0.204816*X2 + 0.204879*X3 + 0.007337X4 + 0.540534* X5 - 0.61452.$$

Where

Y = Milk out put

X1 = Labor

X2 = Dry fodder

X3 = Green fodder

X4 = Concentrate

X5 = Number of milked cow

The regression equation was statistically significant as the calculated level of significance: Prob> F = 0.0000. The coefficient x1, x2, x3, and x5 were statistically significant as could be seen from respective level of significance from table 2. The highest absolute value was productivity per employed person. This means that the share of this independent variable (factor) explained at a most substantial extent of the dependent variable changes (the milk yield).It was observed that regression coefficients of dry fodder and green fodder were found significant for the milk yield. This indicates that dry fodder and green fodder were underutilized for dairy cows indicating that use of more quantities of these inputs will further increase the productivity of milk cattle in the study area. This is similar with the study reported by Haile et al (2012). Lalrinsangpuii and Ravinder, (2016) also described similar result, indicating that the regression coefficients of dry fodder and miscellaneous expenses were found significant for both the local and crossbreed cow. It was perceived that dry fodder and miscellaneous expenses were underutilized for crossbred cows, and green fodder was underutilized for local cows. A study indicated that use of more quantities of these inputs will further increase the productivity of milk cattle in the North-East India (Lalrinsangpuii and Ravinder,

2016).Although with lower regression coefficient, the positive role of lactation milk yield for the concentrate feed at the household level should also be acknowledged.

3.3. Feed source

The feed sources includes all feed offered to dairy cows by the sample households rather than natural pasture. The feed sources used in the study area were like, green feeds (green sorghum leaves, maize leaves, elephant grass, sweet potato leaves), concentrates (grain of ground nut, sweet potato tuber and vein, and by product from hamaressa oil factory), dry fodder (groundnut hulls, sorghum and maize by products) and Khat (Catha edulis) leaves.

Green fodder: In the rural dairy system of Babille, most farmers practice sowing their farmland with maize or sorghum and then thinning the young plants at knee height stage, locally known as chinki, to feed vulnerable and productive classes of dairy cows. Leaves of sorghum and maize are also stripped after setting seed and used as dairy feed. This information is in agreement with previous study done on Smallholder dairy production and marketing systems in Mieso district of Western Hararghe zone of Oromia (Azage et al., 2013). The feed sources were measured using local unit (qabeeand ba'aa,). 1 Qabee = 9 kg; 1 Ba'aa = 18 kg. Accordingly, the farmers also point its price in the local measurement and then converted to standard unit (kg). Green fodder is available in rainy season except elephant grass and its price was 2.33 birr/ kg on average with standard deviation of 0.490667. Respondents' demand forgreen fodder is low because most of green fodder available at rainy season.

Study of Belay et al(2016) indicated that regardless of farm size, the majority (94.4 %) of interviewed farmers used green feeds as the main basal diet, especially during the wet seasons. Green feeds were mainly available from June to September (wet season) as purchase, and freely from open areas(Belay et al, 2016). So, if improved forage supplied to the study area, the seasonal shortage of green fodder might be solved. Green fodder also the most available feed sources and offered in bulky to support the dairy cows. It is offered about 2.9 kg at minimum and 18 kg at maximum per cow/day (table 3). It is mostly available during wet season and consumed when available. The result is in agreement with previous works of (Belay et al, 2016)which reported that the majority (94.4 %) of interviewed farmers used green feeds as the main basal diet, especially during the wet season. Dry fodder: Dry fodder can be in the form of maize stover, sorghum stover and groundnut hull consumed by the dairy cows. Among crop residues, sorghum stover is the major feed sources for dairy cows in study area. This is also measured by Ba'aa, Qabeeand luuqaa then converted to kilogram. 1 Ba'aa =16 kg; 1 Qabee= 4 kg and 1 luuqaa=16kg. Dry fodder is stored to give feed in the dry season. The dry fodder supplied to cows was for about 126.97days/year while green fodder for about 93.26/year (table 3). The left days per year may be covered with natural pasture and other sources of feed. Dry fodder usually stored after harvest and sold to urban dairy keepers in large and also sold to the rural dairy keepers who have shortage of land for crop. The mean price was 1.706513 birr/kg (table, 5).

Crop residues are important source of feed commonly used by dairy animals across all the production systems considered in this study. The ever increasing human population of the country puts pressure on grazing land and encourages the expansion of cropping land, which eventually leaves behind enormous quantity of crop residues for livestock (Azage et al., 2013). However, crop residues are characterized by high fiber refraction, low digestibility and low available nutrients such as crude protein and metabolizable energy, which hardly support dairy animal performance, farmers used in large amount due to its availability and storability (table 3). Concentrate: The commonly used concentrate feed in the study area are a by-product from Hamaressa edible oil factory, groundnuts and in rare case chopped sweet potato which are used as supplement feed. The price of the concentrate has been varying since its source is different and as viewed from the table 3. Maximum concentrate feed price is 10 birr/ kg which was most probably represents concentrate feed purchased from by product from Hamaressa edible oil factory. The existed type of feed is not sufficient as the respondent responded. So, if additional sources feed is adopted for the dairy producers in the study area, they may diversify their feed sources and could be lessen risk related livestock feed.

For instance, the study had been conducted in Jimma town of Oromia region have identified twenty different feed resources: natural pasture grazing, hay, green feeds (fresh or succulent grasses and legumes), concentrates (noug cake, cotton seed cake, grains, molasses, wheat bran, commercial concentrate mix and brewery grain waste and non-conventional feed resources (banana leaves and stems, enset (Enseteventricosum) leaves and pseudo-stems, papaya stems, atela (a by-product of local alcoholic brew), Khat (Catha edulis) leaves. Perceivably feeds have been the primary inputs affecting milk production. Accordingly, on average, concentrate feed consumed per cow per day was 1.838 kg for about 77 days in a year (table, 3). Thus,

it is important to provide concentrate supplements to alleviate the feed shortage and maximize milk production.

3.4. Feeding system and feed quality improvement

Cut and carry system: The feed, primarily forage, is then brought to the animal in appropriate amounts and intervals to effect maximum growth. In the present study, three types of dairy feeding systems were practiced: Freely grazing (9.9 %), Cut and Carry / stall feeding (63.2 %) and Tethering (26.3 %). The dairy animals are managed indoors and, cut-and-carry feeding systems are preferred for them. Cut and carry system is used to generate income and to ensure the economic stability of the household by selling dairy products and breeding calves. Furthermore, overgrazing can be decreased by improving livestock management through a cut and carry fodder system. Generally advantages and positive side effects of cut and carry system are: well fed milk cow with a higher milk production, less risk exposure.

This implies well fed > higher quality milk>higher market price. Furthermore, the cut and carry system benefit some cross cut issues such as: financial benefits, ecological impact, gender impact and community impact. The feed quality issue is related with fulfillment of the nutritional requirements of the livestock under consideration with minimum possible cost. Therefore, the quality of feed considers the nutrient requirement of the livestock under consideration and the nutritive value of feed ingredients available.

Feed conservation: Feed conservation is one of the components of feed management to ensure year-round feed availability. Conservation of crop residues for animal feed is a common practice but the methods of conservation vary among agro-ecologies and production systems, and types of crops grown (Azage et al., 2013). Maize stoker was the principal crop residue followed by sorghum residues which are obtained after threshing the grain in the study area. This is similar with the study conducted in neighboring district named Mieso District by (Azage et al., 2013). However, stovers of sorghum and maize are stacked on the farm field as ‘kuusaa’ by systematically piling of the stover. Majority of the farmers interviewed stored crop residues for their livestock. Accordingly, Pile at home with shed (11.8%), Pile at home without shed (0.7%), Pile at farm with shed (46.7%) and Pile at farm without shed (38.8 %) are commonly practiced in the study area. Those farmers practice pile at farm without shed (38.8 %) may be vulnerable for wastage of feed due to fermentation and pest damage. Due to poor storage system, farmers often fail to get adequate conserved feed to take them up through to the end of the dry season (Azage et al., 2013). As a result, during periods of feed shortage, farmers reduce milking frequency of their dairy cows from twice to once a day as a coping strategy. Physical treatment of such residues, either to reduce their size (e.g., chopping) or to soften them (for example by soaking or wetting) is important to improve palatability leading to efficient utilization of the residues and hence livestock productivity. Chopping of maize and sorghum stalk replied by (48% of respondent) and water soaking of feed with salt (40% of respondent) are the treatment that sampled households practiced when they feed their dairy cows (table 3). This is similar with the findings of Haile et al.(2012) who reported that urban dairy farmers supplement their animals with common salt. Overall, few farmers (8%)have not practiced any treatment on feed during feeding of their dairy cow.

3.5. Milk marketing

In the study area, about 86% of the sampled households’ sale their milk while the remaining 18.3% sampled households consumes at home (Table 5). This indicates that they use milk as main income generation when more milk production is available. In terms of market demand for milk, sampled households are not feeling as major problem rather 90.1% of sampled household accepted as it is moderate.

However, sampled households are questioning as no milk collection association and currently sampled households are forced to sell their milk to individual retailers (93.9%). This add extra cost through transport to take their milk to the market center. In the study area, they used informal cooperatives and sell for each other interchangeable.This was done when they want to sell at central market especially, Babille and Harar town. There were differences of 4 birr (0.56 US$ per liters at village and 0.94US$ at town) selling milk at village and town. Households producing high milk quantity sell their milk to central market. This raises question for formal milk collecting cooperative to be established. So if milk colleting cooperatives are established, they may be able to sale at reasonable price and then increase efficiency of milk production.

Table 1. Descriptive Statistics of Milk Output and Input Used Per Household

Variables	Local breed (N = 124)		Crossbred (N = 11)		Local & crossbred (N =17)		Total (N=152)	
	Mean	Std.	Mean	Std.	Mean	Std.	Mean	Std.
Milk output (L)	1216.2	1033.4	2882.7	2064.7	3977.9	2606.5	1645.7	1657.5
Dry fodder (kg)	1209.5	1003.3	2258.2	1160.7	3075	1866.4	1494.0	1291.8
Green fodder (kg)	1171.9	879.8	2503.4	1269.4	3482.4	1714.3	1526.1	1285.5
Concentrate (kg)	371.5	600.8	869.1	1039.9	1267.7	748.2	507.8	717.4
Number of milked cows	1.8	0.9	1.5	0.7	2.9	1.1	1.9	0.95

Table 2. Regression Analysis of Milk Output Sampled Households Produced

Variables	Coefficient.	Std. Err.	t	P>t
Milk output				
Labor	0.70679***	.0772256	9.15	0
Dry fodder	0.204816***	.0659065	3.11	0.002
Green fodder	0.204879***	.0551234	3.72	0
Concentrate	0.007337	.0086978	0.84	0.4
Number of milked cow	0.540534***	.0785634	6.88	0
Constant	-0.61452	.4243728	-1.45	0.15
Observation =152				
F(5, 146) = 212.66				
Prob> F = 0.0000				
R-squared = 0.8793				
Adj R-squared = 0.8751				
Root MSE = 0.28715				

Note: ***Significant ($p < 0.001$)

Table 3. Feed Type and Amount Offered to Dairy Cows

Feed type and amount, days offered (kg)	Min	Max	Mean	Std.
Dry fodder consumed per cow per day in kg	1.20	13.00	5.77	2.405
Number of days per year dry fodder offered to cow	78.00	230.00	126.97	34.15
Dry fodder used per year/cows	159.8	2015.0	744.40	415.8
Green fodder consumed per cow per day in kg	2.90	18.00	7.96	3.74
Number of days per year green fodder offered to cow	5.00	176.00	93.26	24.59
Total amount of green fodder used per year/cows	225.0	2464.00	763.39	431.0
Concentrate consumed per cow per day in kg	.00	6.00	1.838	1.792
Number of days per year concentrate offered to cow	.00	350.00	76.59	76.69
Total amount of concentrate used /cow/year	.00	1350.00	227.19	261.1
Types of feed treatment	Frequency		Percent	
Urea treatment	1		0.7	
Chopping	73		48.0	
Water soaking with salt	61		40.1	
Silage making	5		3.3	
No treatment	12		8.0	
Total	152		100	

Table 4.Types of Feeding System and Improvement Made on Available Feed Sources

Variable	Practice	Frequency	Percent
Types of feeding	Freely grazing	15	9.9
	Cut and Carry / stall feeding	96	63.2
	Tethering	40	26.3
	Mixture of them	1	0.7
	Total	152	100
Feed conservation types(storage of crop residue)	Pile at home with shed	18	11.8
	Pile at home without shed	1	0.7
	Pile at farm without shed	71	46.7
	Pile at farm with shed	59	38.8
	Left over the field	3	2.0
	Total	152	99.3

Table 1. Milk Marketing in the Study Area

Variables		Frequency	Percent
Households participate in Milk sell	Yes	131	86.2
	No	21	13.8
Market demand	Strong	9	6.9
	Moderate	118	90.1
	Weak	4	3.1
	Neighbors	5	3.8
Customer who buy milk	Retailers	123	93.9
	Hotel	3	2.3
	Total	131	100.0

Table 6.Customer and demand for the milk sold in relation with milk price, market distance and amount of milk

Customer for the milk sold		Price of milk / liter (on average)	Milk market distance in km	Amount of milk sold in liter/year
Neighbors	Mean	12.6	2.1	327.5
	N	5	5	5
	Std. Deviation	1.3	3.3	175.8
Retailers	Mean	12.1	3.7	464.6
	N	123	123	123
	Std. Deviation	1.3	3.3	350.3
Hotel	Mean	13.0	4.7	530.7
	N	3	3	3
	Std. Deviation	1.7	1.8	476.0
Total	Mean	12.2	3.7	460.9
	N	131	131	131
	Std. Deviation	1.3	3.2	346.9
Markets demand for milk				
strong	Mean	13.3	3.1	572.2
	N	9	9	9
	Std. Deviation	1.6	1.8	474.4
Moderate	Mean	12.1	3.8	458.4
	N	118	118	118
	Std. Deviation	1.3	3.3	340.9
Weak	Mean	12.0	2.3	285.0
	N	4	4	4
	Std. Deviation	0.0	1.9	57.4
	Mean	12.1	3.7	464.6
Total	N	123	123	123
	Std. Deviation	1.3	3.3	175.8

3.6. Distance to milk market center and decision factor to whom to sell

The closer the market the lesser would be the transportation cost, reduced transaction costs, reduced trekking time, reduced loss due to spoilage, and reduced other marketing costs. This calls better access to market information and facilities for milk producer. This improves return to labor and capital and increase farm gate price and the incentives to participate in economic transaction. Households sold in far market (4.7 km) to get high price (0.81US$/liter) with strong demand of milk. While those sold to neighbor at 2.25 km (Table 6) fear to go far market and sold at 0.44Us$ per liter with weak market demand (Table 6). Those who get high price are not through effortless but through exhausting different transaction cost. So, if development actors consider to form cooperative and set input considering price, the problem may resolved. Study of Teshager et al.(2013) indicate that distance to market has clear links with the price of dairy product. Farmers decide to sell at available price (price set by buyer) when they couldn't go distance market. But findings of Zewdie et al, (2015) depict that distant households would have less access to market and institutions which could be associated with milk inefficiency. This in turn could discourage farmers' inspiration to undertake dairy production. So it is better for household settled nearest to market center to motivate milk production and improve income generated or form milk collection cooperatives in each milk production area.The result revealed that the most important factor considered for sample dairy households in decision to whom to sell was price, closeness to milk market center and transport availability and secured demand. Price had greatest influence on the producer's decision to whom to sell. About (93.9 % of the respondents) prefer retailer to hotel at town market and also price at hotel is better. Milk sold to neighbor when they have no option to go distance market and sold less volume (Table 5). Milk price from hotel buyers was best, paid 0.47US$ on average for one liter, but due to market distance producers were not willing to sell (Table 6). Those who sold to hotel were who produce more volume of milk.

4. Conclusion and recommendations

The study has shown that green feed, concentrates and dry feeds were the most important feed sources in Babille District. The study revealed that dry fodder and green fodder had positive and significant influence on milk production. It was found that for dairy cows dry fodder and green fodder were underutilized in the study area. Therefore, it is suggested that dairy farmers in Babille District should put more efforts for efficient utilization of these inputs to increase the milk production. The extension agencies should also take more initiative for giving technical guidance to the farmers about scientific dairy farming in general and better feeding management of dairy cows with quality feeds in particular area. By product from Hamaressa edible oil factory were the dominant concentrates for supplementation. Feed scarcity and feed price were identified as the most important constraint especially during the dry season. Lack of access to land for crop was reported as the most important cause of feed scarcity. It was concluded that to ensure sustainable availability of dairy cattle feed in the surveyed area, technological, technical and institutional innovations would be vital. Government intervention in providing improved feed to livestock as well as adjusting feed price in the area should be the first important intervention. The adoption of different concentrate from different areas that are found near the study area, and increased conservation and proper storage and utilization of the locally available crop residues could be important in alleviating feed shortage and reducing the high feed costs. Generally, development actor should intervene in expanding livestock feed industry that have better quality feed and reliable milk marketing in the area.

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