

# Dairy Cattle Production at Small Holder Level in Sidama Zone Selected Districts, Southern Ethiopia

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## Abstract

The study was conducted to study dairy management, production and reproduction performance in Sidama Zone Aroresa Woreda distinct, southern Ethiopia. Multistage and random sampling method was used; 45 households were selected from each agro-ecology (lowland, midland and highland) thus a total of 135 households were selected for the study. The primary data were collected through pre-testing, semi-structural questionnaires and field observation. The obtained data were analyzed or summarized by using descriptive statistics.

The study showed mixed farming system was main dairy production system; different cereal crops were predominantly produced and crop farming is mainly practiced by using oxen. Relatively, natural pasture (66.7%) and crop- residues (22.2%) as major feed were mostly used in lowland than mid land and highland while enset was used by some farmers. Most of the respondents used river as water source for their cattle (72.6%) followed by pond (21.5%) and rain water (5.9%). Majority of farmers housed their cattle with family house (48.1%) followed by in separate house (no shelter with fence) (45.9) and simply in shelter of trees or leaves (5.9%). Age at first mating period was found shorter in lowland areas (3year) than midland(3.5 year) and highland(4 year) and the average calving interval (in year) was also longer in highland (3 year) than lowland and midland (2.5 year). All of the respondents were milking their cattle, two times per day in morning and evening. In average, 1.5 liter milk per day was obtained from each dairy cows however, each households could obtain 1.6 liter milk per day. In year, the average lactation length was found 2.

**Keywords:** Agro- ecology, Dairy, Districts, Ethiopia, Southern

## 1. Introduction

The Ethiopian economy is highly dependent on agriculture. Despite being more subsistence, agricultural production plays an important role in the economy. Agriculture accounts for 46.3 percent of the nation's Gross domestic Product (GDP), 83.9% of exports, and 80% of the labour force (FAO 2004). Many other economic activities depend on agriculture, including marketing, processing, and export of agricultural products. Ethiopia's livestock population is believed to be the largest in Africa, despite large population size contributed about 12-16% of national GDP, 30-35% of agricultural GDP, 15% of export earnings and 30% of agricultural employment (SNV 2008).

In Ethiopia, it has estimated 53.99 million heads of genetically diverse cattle which is also the largest population in Africa (CSA 2013). Among the total population 9.9 million covered by dairy cattle (CSA2013) which is in the hands of pastoralists, agro-pastoralist, mixed crop livestock producer, urban and per-urban dairy cattle producers (Ketema 2000, Zegeye 2003). However, the national milk production and the overall milk consumption in Ethiopia are very low, even compared with other least developed African countries (Zegeye2003, Melesse and Beyene2009).

Cattle profitability is majorly determined by dairy cows reproductive performance (LeBlanc 2007) which is a major determinant for overall productivity of dairy production systems by affecting the efficiency of milk production, the number of calves produced per cow and lifetime milk production (De Varies2006). In turn, husbandry practices like feeding, watering, housing and health care management are being affecting the reproductive performance of dairy cows.

In order to plan and implement cattle development strategies in the study area; it is essential to know about the overall reproduction performance, production and management systems of dairy cattle(feeding, watering, housing and health care). Thus the study was undertaken with the aim to assess the cattle production at smallholder level in three different agro-ecological districts of sidama Zone, South Ethiopia.

## 2. Materials and methods

### 2.1. Description of the study area

The study was conducted from October 2014 to January 2015 in Sidama Zone districts of Aroresa Woreda, Southern Ethiopia. The study area is far from Hawassa city 186 km, and 461km from Addis Ababa. It is situated 6° 20' North Latitude 39° 00' East Longitude. It has variability, in topography and its average rain fall is 733 mm, and the mean annual temperature range is 18.5 °C (AWAO2004 unpublished).

## 2.2. Sampling techniques

The study woreda are grouped in to three agro-ecology lowland, mid land and highland. In the present study, multi-stage and random sampling method was used. In the first step, districts were stratified in to three groups based on agro-ecology (lowland, midland and highland). In the second step, from each stratum (agro-ecology), one districts were selected by using randomizing sampling method; totally three districts were selected. In the same manner, 45 households were selected from each selected districts randomly. Thus a total of 135 households were selected for the survey study.

## 2.3. Data collection method

The data were collected from both primary and secondary sources. The primary data was collected through pre-testing semi-structure questionnaires and field observations. The information's obtained in this way were production system of dairy cattle, feed resource and feeding system, water resource and watering system, housing system, production and reproduction performance. While the secondary data were obtained from bureau of agriculture in Sidama Zone, Aroressa Woreda, internet, Journal, articles and books.

## 2.4. Data analysis

The collected data was analyzed or summarized by using descriptive statistics, represented in table.

## 3. Results and discussion

### 3.1. Production system

All of the respondents in the study area, practiced both crop-live stock production system. In this type of production, both production systems (crop cultivation and dairy cattle production) are complementary and important to farmers' livelihood in the study area, because the products (outputs) of one system are inputs of other production system. Cattle provide power for land preparation and crop transportation after harvest and manure as fertilizer, while crop by-products and residues represent an important source of animal feed; of the crop residues maize stover, wheat, barley and teff straw are the major one. In this production system, different cereal crops predominantly produced include: maize, teff, wheat, enset, barley, sweet potato, potatoes, coffee, banana, mango, and cassava. Of which coffee, wheat, barley, Enset are dominantly produced in highland and mid land agro-ecology. While others like maize, teff, mango are produced in lowland areas in the study areas. Crop farming in this area is mainly practiced by using oxen and oxen are given due attention with lactating cows. Milk and milk products are produced by cattle used for multipurpose; butter and cheese used as source of income to buy farm inputs and family needs, raw milk and butter milk used for family consumption, while cattle are an asset securing farmers at the time of emergency and for breeding purpose. The results of current study were similar to Zewdu et al (2003) in the mid highlands of Ethiopia and Chewaka (2006) in Yirgacheffe area.

### 3.2. Feed sources and feeding system

Type of feed sources and feeding system has its own impact of dairy cattle production and reproduction performance. Reveal from Table 1, the major feeds resources of cattle in the study area were, natural pasture, enset (leaves, stem and roots), crop residues (from teff, maize, barley and wheat) and some farmers also used non-conventional feed like atela, bole and salt.

However, the availability of feed resources were vary across agro-ecology, in lowland more farmers used natural pasture (66.7%) and crop-residues (22.2%) as major feed to feed their cattle than mid land and highland on contrary to only some farmers had used enset/coffee leaves/ non-conventional as major feed sources in lowland than midland and highland. The reason may be as the researchers observed during the study period, the lowland areas are rich in natural pasture, and it is also highly potential cereal crop. Moreover, human populations are highly sparse thus they have large land size for grazing. On the other hand, mid land and highland, they are highly populated and they have small land size for cropping and grazing however, these areas are potential of perennial crop like coffee, enset etc.

When feed their cattle most were used free grazing (61.5%) on natural pasture throughout the year on the same place however, this is highly affected natural pasture quality and quantity; 26.7% of used rotational grazing but zero grazing (cut and carrying feeding system) was used by only some farmers, of which most were from midland and highland. In the study area, almost all were supplementing for their cattle in dry season. Usually, during the wet season, some weight gain and milk production is achieved which is followed by variable losses during the dry season depending on the pressure on grazing land and quality and quantity of vegetation.

The current study was comparable with Nanyeenya et al (2008) study in Uganda who reported that crop residues, kitchen wastes like crop peelings, sheaths and haulms, stems and leaves of cereals and bananas left after harvests and crop thinning of mostly cereals like maize are major sources of feed for cattle on crop-livestock production systems. Similar study was also conducted by ESAP (2008) which stated that grazing of pastures, fallow lands and crop-residue are major feed resource of livestock, the study also state that the

increasing human population and expansion of cropping in to grazing area, the importance of natural pasture is a source of feed is decreasing the time to time. However, the results of current study was disagreed to Girma et al (2014) study in urban and peri-urban dairy production system(Adam tulu, Ethiopia) due to shortage of grazing land most farmers feed their dairy cattle by cutting green feeds, crop residues, agro-industrial byproducts, Katikala atela and mill byproduct.

**Table 1: Major feed sources and feeding system by respondents in percentages**

Feed Sources	Agro-ecology						Total	
	Lowland N=45		Midland N=45		Highland N=45		N=135	%
<b>Major feed sources</b>								
Natural pasture	30	66.7	22	48.9	18	40	70	51.9
Crop-residues	10	22.2	9	20	9	20	28	20.7
Enset/coffee leaves	3	6.7	10	22.2	12	26.7	25	18.5
Non-conventional	2	4.4	4	8.9	6	13.3	12	8.9
<b>Feeding system</b>								
Free grazing	32	71.1	27	60	24	53.3	83	61.5
Rotational grazing	12	26.7	12	26.7	12	26.7	36	26.7
Zero grazing	1	2.2	6	13.3	9	20	16	11.9

### 3.3. Water sources and watering system

In Table2, water sources and watering system by respondent is presented. Water is a determining factor for all activities of animals' water problem in amount and quality and can cause problems like constipation, dry digestive tract, reduce metabolically activities with emaciated body condition (Tsedeke2007). In the study area, most of the respondents used river as major water source for their cattle (72.6%) even though its quality and availability are season dependent.

As observed during the survey, households that use river water for their animals do not treat it, or it is not filtered and some farmers were used pond and rain water (open ground water). In closed to current result Asrat et al (2013) reported from Bodit, Ethiopia; rivers, tape water and spring were importance's of water sources for dairy cattle. Dessalegn( 2015) also reported similar result in Bench-Maji Zone, Southwest Ethiopia farmers had used rivers, springs, borehole water and dam/pond and rain water as main sources of water for their cattle during the dry and wet season. In lined with present study Teshager et al (2013) had reported similar result from Ilu Aba Bora Zone of Oromia Regional State, South Western Ethiopia; the main sources of water for cattle are river, pond, and pipe line.

Regarding on frequency of watering to dairy animals varies from one agro-ecology to another, which might be affected by different factors, among which season, accessibility (getting easily), performance and/or breed of the animals and type of predominant feed (dry or wet) and feeding systems (indoor or outdoor where some water is available). Most of the respondents have said that they gave water for their cattle only once per day (88.9%); the highest proportion was found in highland (97.8%) through midland (86.7%) to lowland (82.2%). In the other way, some famers (11.1%) gave water for their dairy cattle twice per day and relatively more were found in lowland and midland areas. This might be related to heat effect on the environment (feed type) and animals. According to respondents, this was especially more sound in winter season due to heat effect at that period. Thus more water is needed by animals similarly results have reported by Tsedeke (2007 from Aleba Wereda, Ethiopia and Asrat et al (2013) from Bodit, Ethiopia. Asrat et al (2013) had described that during the dry season; almost all of the households provide water to their animals once a day except the household that live around or near watering points or rivers. However, Teshager et al (2013) reported that the watering frequency of cattle; twice a day, once a day and ad libtum.

**Table 2: Water sources and watering system by respondent in percentage**

	Agro-ecology							
	Lowland		Midland		Highland		Total	
	N=45	%	N=45	%	N=45	%	N=135	%
<b>Source of water</b>								
River	35	77.7	36	80	27	60	98	72.6
Pond	9	20	7	15.6	13	28.9	29	21.5
Rain	1	2.2	2	4.4	5	11.1	8	5.9
<b>Watering system</b>								
Once a day	37	82.2	39	86.7	44	97.8	120	88.9
Twice a day	8	17.8	6	13.3	1	2.2	15	11.1

### 3.4. Housing system

It is very important to provide appropriate conditions for rearing dairy cows by reducing the extreme effects of climate such as heat, and moisture. Good housing and layout of the farm can reduce stress. Environmental control improves milk production by reducing stress and disease hazards, also making management easier. Of the dairy management program, housing can be one of the main determinants of productivity. Different Factors which need to be considered in choosing land for farming are fertile land, no evidence of flooding during the wet season, convenient for transportation, proximity to the milk collecting centre, access to supplies for farming, clean and sufficient water all year, and distance from factories or other farms which may release bad odours or lead to pathogenic infections.

Of the interviewed farmers; 48.1%, 45.9% and 5.9% were housed their cattle together with family house, differently from family house (no shelter) and simply used shelter of trees respectively (Table 3). However, calves were always housed separated from their dams in a barn constructed as an expansion of the main houses or separately in and around the family house. The house types with no shelter, the animals are exposed to rain, cold, temperature. The housing type of cattle together with family (in the same house) was practiced; because households are perceived that it is suitable to protect animals from extreme environmental hazards and also for ease of husbandry practices such as feeding, watering, and milking. However, as the researchers observed it, it has problem in designing which is unproportional to number of cattle's to the size of room were the animal housed. The result of present study was in contrarily to workneh (2002) result who reported that the housing type was designed in proportional to the number of animals. In addition, as the researchers observed in the current study areas, the housing style has problem in site selection and orientation from direction of wind with no ventilation. This could be the reason for most cattle in study area, which cause to being thin and emaciated their body condition performance. However, results of Asrat et al (2012) in Boditti and Bereda et al (2012) in Guraghe areas, Ethiopia were in consistence to results of current study. According to Asrat et al (2012) study, cattle are housed together with family and some also in separate house. Dessalegn (2015) also reported similar result in Bench-Maji Zone, Southwest Ethiopia in his study area all farmers house their cattle separate house not far from family house at night to protect them from cold, rain, predators and theft. However, Teshager et al (2013) had reported from Ilu Aba Bora Zone of Oromia Regional State, South Western Ethiopia cattle are housed in separate and closed house that was roofed with grass thatched or corrugated and tin sheets; majorities are tethered their animals in the open fenced barn with no roofing.

In the study area, about 64.4% of the respondents cleaned dung and urine from dairy cattle house twice a day in morning and evening; while 35.6% were cleaned only once per day in morning (Table 6). Sanitation of house is necessary to have health and good body condition performance dairy cattle as it enables to control and prevent of different transmissible and contamination diseases and parasites which cause to sick, reduce production and reproduction performance of dairy cattle. The current result was in consistence with Workneh (2002) study.

**Table 3: Housing system and cleaning frequency by respondents in percentage**

	Agro-ecology							
	Low land		Mid land		highland		Total	
	N= 45	%	N=45	%	N=45	%	N=135	%
<b>Housing system</b>								
Together with family	18	40	21	46.7	26	57.8	65	48.1
Different from family house	22	48.9	22	48.9	18	40	62	45.9
Shelter of tree	5	11.1	2	4.4	1	2.2	8	5.9
<b>House cleaning frequency</b>								
Once a day	15	33.3	15	33.3	18	40	48	35.6
Twice a day	30	66.7	30	66.7	27	60	87	64.4

### 3.5. Health care

Health care is one of the management aspects of dairy cattle production. To improve the production of dairy cattle should be kept healthy. According to respondent's discussion, the most predominant dairy cattle killer diseases were mastitis foot and mouth, and anthrax diseases. They indicated that the effect is more severe during summer and spring seasons because in those periods, the environment is conducive for different parasites and microbes reproduction.

Signs of diseases include loss of appetite, reduced daily milk yield, increased temperature, high respiratory rate, tongue protruding, open mouth breathing, inability to lie down etc. Healthy animals are alert, active, have bright eyes, with no discharge, smooth and shiny skin, breathe and urinate regularly, and their tail moves to drive away flies. Recognizing of these signs enable to detect whether animal is ill or health, in turn it enable to adjust for controlling, preventing and treating the dairy cattle. Of course, control of diseases, which are transmissible from cattle to humans, spread through vectors or wild animals, or epizootic diseases is normally the responsibility of governments and international agencies. The control of other diseases and parasites is the responsibility of herd owners. Vaccination programs against endemic diseases are usually required by national laws which should strictly followed by dairy farmers, co-operative and dairy organizations. In the study area, the farmers had used different prevention, control and treatment methods; most were used only tradition medicine methods (indigenous knowledge) for example they used different leaves and roots plants like *Godicho*, Nole, Tobako (local name) etc and modern different tablets; while others some were tradition medicine and modern. Similar to current study different scholar had reported Laisser et al (2015) from Lake Zone in Tanzania; Daodu et al (2009) in Oyo area of Southwest Nigeria; Dessalegn(2015) in Bench-Maji Zone, Southwest Ethiopia and Rosati et al(2009).

### 3.6. Reproduction and production performance

Reproductive performance of some parameters of dairy cattle is presented in Table 4. As presented in Table 4, the average age at puberty (age at first mating period) was found shorter in lowland areas than midland and highland specially, in highland areas, the animal too late mature for mating (4 year). The average calving interval (in year) was also significantly longer in highland than lowland and midland This may relate to the feed availability of cattle in lowland which is better than mid land and highland; the opposite is also true in highland areas due to shortage of grazing land the animal could not get enough diets.

Regarding on the frequency of milking, all of the respondents were milking their cattle, two times per day in morning and evening and they had milk by their hand. In average, 1.5 liter milk per day was obtained from each dairy cows however, each households could obtain 1.7 liter milk per day. In year, the average lactation length was found 1.7.

The average milk yield of cow per day in present study observed (1.5 litres per day, 547.5 litres per year) was higher than Eyassu and Reiner (2014) study from Dire Dawa Local (300 litres) and cross (3217 litre) in year per cow however, it was below the values 400-680 litres (2.95litre) and 1120-2500(9.9 litres) in year milk per cow reported by Ahmed et al 2004. Moreover, the average lactation length (1.7 year) in current study was significantly longer than Eyassu and Reiner (2014) study from Dire Dawa who stated that 150 days for local and 195 days for cross cow. The average calving interval, in the present study was significantly longer than Assaminew and Ashenafi (2015) resulted in Central Highland of Ethiopia who found 14.3 and 15.4 months in urban and per-urban areas. The reason for having longer calving interval in the present study might be due to poor feeding practices and nutrient supplies (in rural areas). Thus, poor feeding practices, adversely, affected the synthesis and secretion of hormones responsible for ovarian follicular development and function leading to extended calving interval in these cows (Thatcher et al 2008). The current result was in closed to Komwihangilo et al (2009) study of improved cattle in agro-pastoral systems of Central Tanzania who found that 3-4 years of age at first mating; 19-32 months of calving interval and 1-2 liters milk yield per day from indigenous Tanzania Shorthorn Zebu breed (TSZ) however, the current results was in argument from results of crossbred (Mpwapwa x TSZ) and Mpwapwa breed cattle who found that 2-3, 2; 3-4, 4-6; 15-18 and 12-18 age at first mating, calving interval and milk yield respectively.

The types of nutrient supplies and feeding practices are major factors that determine the productive and reproductive performances of dairy cows (Ahmed et al 2004).



**Table 4: Average production and reproduction performance of dairy cattle by respondent**

Traits	Agro-ecology			
	Lowland(45)	Midland(45)	Highland(45)	Total(135)
Age of puberty ( in year)	3	3.5	4	3.5
Calving interval (in year)	2.5	2.5	3	2.7
Frequency of milking per day	2	2	2	2
Amount of milk /cow /day(litre)	1.5	2	1	1.5
Amount of milking/ households/ day (litre)	1.5	2	1.5	1.7
Lactating length (in year)	1.5	1.85 (1-2)	1.75(1-2)	1.7

## 5. Conclusion

All of the respondents in the study area practiced mixed farming system/crop-live stock production system. Crop cultivation and dairy cattle production are complementary and are important to farmers' livelihood. The majority of feed sources for dairy cattle production in the study area were natural pasture, followed by crop residues, Enset/coffee leaves, and a few of used non convectional feeds (atela, salt, bole). The dominant crops produced: maize, teff, Enset. River, rain water, and pond were main source of water for dairy cattle. The housing system were different from households to households houses, major have housed together with family house and in separated house and some other used simply shelter. In the study area, the farmers had used traditional and modern medicine to treat and control different diseases. The average age at first mating period was found shorter in lowland areas than midland and highland specially, in highland areas, the animal too late mature for mating (4 year). The average calving interval (in year) was also significantly longer in highland than lowland and midland. In average, 1.5 liter milk per day was obtained from each dairy cows however, each households could obtain 1.6 liter milk per day. In year, the average lactation length was found 2.

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