

# Dairy Production System in Lowland Areas of Gambella, Ethiopia

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**Abstract**— *The objective of this study was to identify and assessing the different types of dairy cattle production systems, management practices, marketing and its constraints that exist in the Itang district. A total of 120 households were selected from four kebeles using simple random selection method after identifying the dairy owner from the community using purposive sampling method. Descriptive statistics, one way ANOVA, chi-square and ranking were analysed using SPSS statistical package. The majority of producers (63.3%) in the pastoral system produced milk for home consumption, while the majority of mixed crop–livestock producers (40.0%) produced milk for selling purpose. In the mixed crop–livestock system, mostly cereal crop based grazing is the major feed resource but these feed resources were managed in a traditional ways. Almost all respondents in the mixed crop-livestock system (96.5%) and pastoral system (100%) did not supplement their lactating cow with additional feeds. More than 400 cattle herds from 2-3 villages graze together between 10 am to 4 pm daily. The majority of households (68.3%) in the mixed crop–livestock system kept their cattle separately in barn, while other 8.3% of the households did the same in pastoral areas. Constraints for dairy development in the area are diseased condition, thieves, lack of veterinary services, lack of credit, feed and feeding and poor extension services. It can be concluded dairy cattle production in the mixed crop-livestock system was economical and based on mixed agriculture (crops plus livestock) with some fishing activity, mining and wild food collection.*

**Keywords**— *Milk yield, dairy cattle, Marketing, Gambella, production system.*

## I. INTRODUCTION

In Ethiopia, dairy production is mainly of subsistent type largely based on indigenous breeds of cattle. Milk production from this system is low to support the demand for the continuously increasing human population, particularly in urban centers (Azage and Alemu, 1998). The development of the dairy sector in Ethiopia can contribute a considerable role to poverty. However, dairying has not been fully exploited and encouraged as compared with other neighbor countries like Kenya, Uganda and Tanzania (Sintayehu, et al 2008). Ethiopia has recently elaborated a number of agricultural policies and strategies aimed at creating and enabling an environment for investments in the dairy sub-sector, the main thrust of which is to promote labor-based technologies and land capitalization aimed at production for both the domestic

and international markets as reported by Yien D., (2014). Despite huge dairy cattle population in Ethiopia, smallholders are not the beneficiaries of this opportunity owing to constraints like inadequate nutrition, disease, lack of support services such as extension services, inadequate information on improvement, marketing opportunities and other factors.

Itang district is known for its more cattle population in Gambella region. However, the fact that the cattle types are naturally selected for adaptation to disease and harsh climate than for productivity on one hand and predominance of extensive livestock production system on the other deviates the rank with regard to the quantity of the products. This condition calls for both genetic and systemic aspects of dairy cattle improvement. Wider potential to improve the production system exists in the

lowland regions of the country. This is because the low lands have lower density of human and cattle population, and the production system is predominantly pastoralist and mixed crop- livestock. Dairy production in pastoral and mixed crop-livestock area of the region is found in association with traditional production system: communal grazing system and unimproved husbandry system

One of the pre-requisites in designing dairy production strategy for a country or a region is investigation and assessing of the production systems and the traditional management practices prevailing in the area. There have been a number of such types of researches in the country, which are limited to the highland and mixed crop-livestock farming systems. Little has been done in the lowland areas like Gambella, which are characterized by low rainfall, high temperature, prevalence of important diseases and low forage production. Therefore, the objective of this study was to identify and assessing the different types of dairy cattle production systems, management practices, marketing and its constraints that exist in the Itang district so that appropriate recommendations can be tailored to the specific needs of the farmers in each production

## II. MATERIALS AND METHODS

### Study Area

The study was conducted in Itang special woreda of Gambella National Regional State (GNRS), Ethiopia. Itang is located in the southwest part of Ethiopia, about 825 km from Addis Ababa, which is 48 km far from Gambella the capital city of Gambella (GPNRS, 2003). The annual rainfall and annual average temperature are 1247 mm and 34.37 °C, respectively (IAR, 1990).

### Sampling Techniques

Prior to sampling of the participants, very extensive discussions were held with Woreda livestock experts and development agents by preparing short meeting to make clear the purpose of the study and for the establishment of community-based dairy production improvement program.

Individual households having dairy cows of any breed and herd size were identified and listed in selected kebeles. After doing so, a total of 120 households were selected from four kebeles using simple random selection method after identifying the dairy owner from the community using purposive sampling method. Thus 120 households were selected 60 from pastoral system and the remaining 60 from mixed crop- livestock; 30 households owning dairy cattle were randomly selected from each kebele. To capture gender effects in the overall production system the sample household on each rural kebele was stratified in to female and male headed households.

### Methods of Data Collection

In each of the study kebele's and PA's discussions were made with agricultural development agents, woreda agricultural officers, and 8 to 15 selected households based on experience on dairy farming activity to know the priority of production performances, marketing aspects, management practices, and major constraints for dairy production in the area and Each group was given the chance to identify the different selection criteria for dairy cows.

### Statistical Analysis

The data collected using different methodologies were analyzed using SPSS statistical package (16.0, 2007). Descriptive statistics, one way ANOVA, chi-square and ranking were used in data analysis.

## III. RESULTS AND DISCUSSIONS

### Characteristics of Crop and Land Holding

The overall results from the survey is presented in Table 1 which predicts that majority (46.7 %) of the household had crop land which was in the range of 2- 2.5 ha and the rest 35.8 and 17.5% of the house hold of crop land were owning less than 1.5 and 3-4 ha respectively.

Table 1: Means and standard errors of crop land of the households in different production systems

Crop land	Pastoral (N=60)		Mixed crop- livestock (N=60)		Overall (N=120)	
	Frequency	%	Frequency	%	Frequency	%
1- 1.5 ha	31	51.7	12	20	43	35.8
2- 2.5 ha	26	43.3	30	50	56	46.7
3-4 ha	3	5	18	30	21	17.5

N= number of observations, ha= hectare

### Livestock and Cattle Herd Composition

The livestock herd size and composition in the different production systems are shown in Table 2. In the mixed crop-livestock production system, the livestock herd was dominated by poultry (30.33), cattle (29 %) followed by goat (23.4%) and sheep (16.6%). The result was not in agreement with the results of IPS (2000), who indicated that the livestock herd in Somali region was dominated by

cattle (58.1%) and goats (53.2%). In contrast to our finding in the mixed crop-livestock system, the livestock herd in the present study was dominated by cattle (36%) in pastoral production system followed by goat (27.9%), poultry (25.6%) and sheep (10.5%). These results agree with the results of Daodu *et al.*, (2009) which showed that cattle constituted 36 per cent of the herd in Oyo area of Southwest Nigeria.

Table 2: Average of livestock herd size and composition in pastoral and mixed crop- livestock production system (Mean±SE)

Livestock species	Pastoral		Mixed crop- livestock		Overall	
	Mean± SE	%	Mean± SE	%	Mean± SE	%
Cattle	12.51±0.32	36.0	9.35±0.38	29.0	10.93± 0.28	32.50
Goat	9.70±0.49	27.9	7.40±0.38	23.4	8.56± 0.32	25.65
Sheep	3.63±0.46	10.5	5.26±0.34	16.6	4.45± 0.29	13.55
Poultry	8.90±0.39	25.6	9.58±0.55	31.0	9.23± 0.34	28.30
Total	34.98±0.89	100	31.58±0.80	100	33.28±0.61	100

SE= Standard Error

All the cattle owned by the sampled households were indigenous. The overall cattle herd size and composition in both mixed and pastoral dairy production was dominated by cows and accounts for (43.5%) followed by heifer (16.1%) and bulls (15.4%). Next to dairy cow, heifer and calf comprised a significant proportion of the livestock herd in both mixed crop livestock and pastoral areas. There was no significant ( $p>0.05$ ) difference between bull and steer of livestock holding with the respect to production systems. This is in line with the finding of Kedija (2007) who indicated that cows dominated the cattle herd

composition at Mieso district. In the pastoral dairy production system, cows contribute the higher proportion that accounted for (46.5%) followed by heifers (17.2%), calves (14.7%), bulls (13.4%) and steers (7%). The present result is in line with the work of Kabsaye (2002) he studied in pastoral area of Eritrea and in his report, the household herd structure for the lowlands of Eritrea were female dominated. In mixed crop-livestock producers, cows also contribute the higher proportion that accounted for (39.5%) followed by bulls (18%), calves (14.5%), heifers (14.5%), and steers (12.2%), respectively.

Table 3: Means and standard error of cattle herd size and composition in different production systems

Cattle types	Pastoral dairy (N=60)		Mixed crop livestock (N=60)		Overall (N=120)	
	Means(SE)	%	Means(SE)	%	Means(SE)	%
Cows	5.81±0.26	46.5	3.7±0.21	39.5	4.75±0.19	43.5
Heifers	2.16±0.22	17.2	1.36±0.13	10.4	1.76± 0.13	16.1
Bulls	1.68±0.15	13.4	1.68±0.17	18	1.68±0.11	15.4
Calves	1.85±0.11	14.7	1.68±0.17	15.5	1.65±0.07	15.1
Steers	1.00±0.11	7	1.15±0.15	12.2	1.07±0.09	9.8

### Purposes of Keeping Cattle

Dairy producers in pastoral and mixed crop–livestock production systems had also different purposes for keeping cows (

Table ). There is a big difference between the mixed crop-livestock and pastoral production system, where the

majority of proportion of households (40.0%) in the mixed crop- livestock system produced milk primarily for sale,

while the majority of households (63.3%) in the pastoral production system used milk for household consumption.

Table 4: Primary purpose for Rearing cattle by dairy farmers in Pastoral and Mixed crop–livestock production systems

Primary purposes dairy cattle	Frequency (Index)	
	Pastoral system(N = 60)	Mixed crop-livestock (N = 60)
Produce milk for sale	8 (0.22)	24 (0.26)
Produce milk for consumption	38 (0.32)	15 (0.24)
For meat production	3 (0.12)	10 (0.20)
For asset	6 (0.18)	7 (0.17)
Dowry	5 (0.16)	4 (0.13)

N=Sample households,

### Milk Production and Reproductive Performances

Majority of households in both the mixed crop-livestock and pastoral production indicated as twice milking is a common practice. The present result is in agreement with the result in East Showa, where milking takes place twice a day (Lemma *et al.*, 2005).

In pastoral production system, the means average milk yield/head/day at beginning, middle and end lactation stages was  $2.00 \pm 0.08$  liters,  $2.99 \pm 0.08$  liters and  $1.84 \pm 0.09$  liters, respectively. Unlike pastoral, high milk yield/head/day at beginning, middle and end lactation stages was reported in mixed crop-livestock production system  $1.99 \pm 0.08$  liters,  $3.46 \pm 0.10$  liters and  $1.57 \pm 0.084$  liters, respectively. There were no significant

( $P > 0.05$ ) difference among the studied production systems in the first lactation stage (1-2 months)

According to the household respondent the average amount of milk yield/head/day obtained in this study at beginning, middle and end lactation stages were  $2.00 \pm 0.06$  liters,  $3.23 \pm 0.07$  liters and  $1.72 \pm 0.06$  liters, respectively in both production system. These values were higher than the average of 1.4 liter/day/cow in Oromia regional state as reported by (Workneh and Rowland, 2004) and the average milk yield of local Arsi cows (1.0 liter /head /day) (Lemma *et al.*, 2005a). But the result of this study is lower than the average daily milk yields reported by Abereham (2009) (4.06 and 4.47 liters) at western Zone of Tigray.

Table 5: The overall milk yields from dairy cows in pastoral and mixed crop- livestock production system.

Lactation stage	Milk yields (Mean $\pm$ SE)		
	Pastoral (N=60)	Mixed crop-livestock (N=60)	Overall (N= 120)
Lactation stage I	$2.00 \pm 0.08$	$1.99 \pm 0.08$	$2.00 \pm 0.06^{NS}$
Lactation stage II	$2.99 \pm 0.08$	$3.46 \pm 0.10$	$3.23 \pm 0.07^*$
Lactation stage III	$1.87 \pm 0.09$	$1.57 \pm 0.084$	$1.72 \pm 0.06^{**}$

\*=Significance difference ( $P < 0.01$ ), \*\*= Significance difference ( $P < 0.05$ ), NS=no significance ( $P > 0.05$ )

Average daily milk consumption per household was higher in pastoralist's area ( $1.33 \pm 0.09$ ) than mixed crop–livestock ( $1.12 \pm 0.081$ ). Because in mixed crop-livestock production the primary purpose of keeping dairy cattle is for selling

rather than household consumption due to market access. There was no significance ( $P > 0.05$ ) difference daily milk consumption among the production systems.

Table 6: The average daily milk consumption of dairy cows in pastoral and mixed crop- livestock production system.

Daily milk consumption (lit/HH)	Production system		
	Pastoral system	Mixed crop- livestock	Over all
N	60	60	120

Mean	1.33	1.12	1.23
SE	0.095	0.081	0.06

HH: Indicates household, N: Number of students, SE=Standard error (P>0.05)

The estimated overall age at first calving for cows was estimated about  $49.35 \pm 0.22$  months. As indicated in the (Table 7) the age at first calving for cows in mixed crop-livestock was higher  $48.12(0.25)$  months less than that of pastoral production system  $50.50(0.31)$  months. There was significant ( $p < 0.05$ ) variation among the studied production systems in age at first calving of cows. As presented (Table 7) the overall mean calving interval of cows was found to be  $18.61 \pm 0.17$  months. The results of respondents show that the calving intervals of cows was higher  $17.61 \pm 0.19$  months in mixed crop-livestock and is less than that of pastoral production system  $19.65 \pm 0.21$  months. There were significant ( $P < 0.05$ ) variations among the production systems in calving intervals of

cows. Number of services pre conception in pastoral production was  $2.28 \pm 0.12$  which was higher than that of mixed crop-livestock production system  $2.01 \pm 0.11$ . There was no significant ( $p > 0.05$ ) difference among the studied production system in number of services pre conception. From these results the overall means of number of services pre conception was  $2.15 \pm 0.08$  in studied production systems. As presented (Table 7) average lactation length for cows was  $8.13 \pm 0.13$  months. The lactation length of cow in mixed crop-livestock was  $8.45 \pm 0.17$  months which is shorter than that of Pastoral dairy production system  $7.81 \pm 0.19$  months. There were significant ( $P < 0.05$ ) difference among the studied production systems in lactation length.

Table 7: Mean and standard errors of performance parameters of cows in different production systems

Variables	Performance (Mean $\pm$ SE)		
	Pastoral (N=60)	Mixed crop-livestock (N=60)	Overall (N=120)
Age at first calving (months)	50.50(0.31)	48.21 (0.25)	49.35 (0.22)*
Calving interval (months)	19.65 (0.21)	17.58 (0.19)	18.61 (0.17)*
Number of services per conception	02.28 (0.12)	02.01 (0.11)	02.15 (0.08) <sup>NS</sup>
Lactation length (months)	07.81 (0.19)	08.45 (0.17)	08.13 (0.13)**

N= number of observations, SE= standard error \*= Significant difference ( $p < 0.01$ ), \*\*= Significant difference ( $p < 0.05$ ), NS= Not significant difference ( $p > 0.05$ )

### Milk Marketing

Mixed crop-livestock area had relatively better market for fresh milk, surplus products was presented for urban dwellers located in Itang town.

Table 8: Sales of milk and milk by-product by household, its price (ETB) and consumption during wet and dry in pastoral and mixed crop-livestock production system.

Type of product and its price	Pastoralists (N=60)	Mixed crop-livestock (N=60)	P-value
	Mean $\pm$ SE	Mean $\pm$ SE	
Fresh milk sales liter/day/HH			
Wet season	0.76 $\pm$ 0.05	1.10 $\pm$ 0.05	0.00
Dry season	0.28 $\pm$ 0.03	0.32 $\pm$ 0.23	0.32
Butter sale kg/week/HH			
Wet season	0.28 $\pm$ 0.026	0.40 $\pm$ 0.03	0.04
Dry season	0.11 $\pm$ 0.02	0.17 $\pm$ 0.023	0.06
Fresh milk price(Birr/liter)			
Wet season	2.89 $\pm$ 0.13	3.85 $\pm$ 0.08	0.000
Dry season	8.78 $\pm$ 0.10	7.96 $\pm$ 0.11	0.000
Butter price (Birr/kg)			
Wet season	23.38 $\pm$ 0.40	27.00 $\pm$ 0.48	0.000

Dry season	31.88±0.34	37.75±0.35	0.000
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HH: Indicates household

Milk and milk by products prices varies around different seasons and in different locations. A high percentage of respondents 60 percent mixed crop- livestock indicated that amount of milk sale increases during the wet season. This increase in milk yield and supply to the market is mainly due to more cows calving in the wet season and increased feed availability.

The major constraints for milk marketing as identified by the producers in Itang district are low milk quantity (37.5%), long distance to market (31.7%), spoilage (17.5% and cultural limitation (13.3%). Out of the total

respondents, majority of pastoral production system constraint was long distance to market access (48.3%), spoilage (21.7%), insufficient amount of milk (15%) and cultural limitation (15%). The mean average distance women travel to sell milk in pastoral production system was 24.45± 3.23 km and ranges from 20 to 30 km. The long distance to market of households in Dorong kebele decreases their participation in milk marketing.

Table 9: Market constraints for marketing of dairy milk in different production systems

Market constraints	Pastoral system (%)	Mixed crop- livestock (%)	Total (%)
Low milk quantity	15	60	37.5*
long distance to market	48.3	15	31.7*
cultural limitation	15.0	11.7	13.3**
Spoilage	21.7	13.3	17.5**
Total	100	100	100

\*= Significant difference ( $p < 0.01$ ), \*\*= not Significant difference ( $p > 0.05$ )

### Dairy Cattle Husbandry and Management Practices

Household members participation in various dairy animal management in the studied area and was found to be dependent not only on the sex and age of the family members, but also on the type of the herds possessing. Grandin *et al.*, (1991) also noted that allocation of labour to different tasks by different age and sex of the family members is a strategy used to overcome labour shortage and this strict allocation of tasks to various age and sex groups is a typical feature of pastoral system in general (Fratkin, 1987). In the mixed crop–livestock system, mostly cereal crop based grazing is the major feed resource but these feed resources were managed in a traditional ways that means all the species of the livestock were allocated to graze these grazing lands together which further was causing overgrazing problems. Out of all the respondents of mixed crop- livestock 90 percent did not supplement their lactating cows with additional feeds,

while only 10 percent used to supplement their dairy cows with additional feeds other than grazing.

The major dairy cattle feed sources available in pastoral production system of the studied area are natural grazing. More than 4000 cattle heads from 2-3 villages graze together between 10 am to 4 pm daily. Productivity of the open savanna is at its peak during April to June when succulent pasture is available; July to September fibrous pasture and October to November standing hay exists. The month of November the rangelands are burnt and for the following 6 months there will be shortage of feed.

The surveyed farmers used different water resources for their cattle in the study areas. The main sources of water identified in the study areas were rivers (47.5%), lakes (30.8%), ponds and wells (20.0%) and pipe water (1.7%). These results are in agreement with the results of Kedija (2007) which showed that rivers as water sources constituted (78 %) in Mieso district.

Table 10: Water sources and frequency of watering of dairy cow in different production systems

Water source	Production system		
	Pastoral (N= 60)	Mixed crop – livestock(N=60)	Over all
1. rivers	35(58.3)	22(36.7)	57(47.5)**
2. lakes	18(30)	19(31.7)	37(30.8) <sup>NS</sup>
3. ponds and wells	6(10)	18(30)	24(20)*

4. pipe water	1(1.7)	1(1.7)	2(1.7) <sup>NG</sup>
<b>Watering frequency</b>			
1. freely at all time	33(55)	27(45)	60(50) <sup>NS</sup>
2. twice a day	16(26.7)	13(21.7)	29(24.2) <sup>NS</sup>
3. once a day	11(18.3)	20(33.3)	31(25.8) <sup>NS</sup>

\*= Significant difference (p<0.01), \*\*= Significant difference (p<0.05), NS= Not significant difference (p>0.05)

Most households (68.3%) in the mixed crop–livestock system kept their cattle separately in barn, while considerable proportions (23.3%) used mixed open barn/shed and rest 8.3% have no houses for their animals. This result is in agreement with the finding of Sintayehu *et al.*, (2008) of Shashemene- Dilla area. The average weaning age of calves in the studied areas was found to be

6.25 ± 0.084 months in mixed crop-livestock system and 6.60 ± 0.095 months in pastoral production system (Table 13). There were no significant (p>0.05) variation among the production system in the weaning age of calves The finding of this study is lesser when compared to the result with the report of (Tesfaye 2008) who found 9.9 ± 0.28 months weaning age in Metema woreda.

Table 11: The average weaning of calf in pastoral and mixed crop- livestock production system

Weaning age	Production system		
	Pastoral system	Mixed crop- livestock	Over all
N	60	60	120
Mean	6.25	6.60	6.42
SE	0.084	0.095	0.065

HH: Indicates household, N: Number of students, SE=Standard error (P>0.05)

The major diseases of dairy cattle identified in the studied areas were Trypanosomiasis (51.7%) which constitute the higher proportion followed by Pastuerllosis (22.5%), Table . Mastitis is also one of the major diseases in the studied areas but farmers are not aware of it because they thought that cannot causes death of animals. All the respondents in mixed crop-livestock and pastoral

CBPP (13.3%), FMD (8.3%) and rest (4.2%) contributed by internal and external parasites as visible in production system reported that calves are more susceptibility than cows and bulls. Chi-square results indicated that there was highly significant (p<0.05) higher variation among the production systems.

Table 12: Frequency and percent of major diseases in the pastoral and mixed crop- livestock production system

Diseases	Pastoral (N=60)		Mixed crop- livestock (N=60)		Total	
	Frequency	%	Frequency	%	Frequency	%
Trypanosomiasis	34	56.7	28	46.7	62	51.7
Pastuerllosis	11	18.3	16	26.7	27	22.5
CBPP	7	11.7	9	15.0	16	13.3
FMD	5	8.3	5	8.3	10	8.3
Internal and external parasites	3	5.0	2	3.3	5	4.2
Total	60	100	60	100	120	100

CBPP= Contagious Bovine Pleuro Pneumonia, FMD= Foot and Mouth Disease, N=Sample respondent

According to the farmers ranking, Traypanosomasis was the highest deleterious and prevailing disease followed by Pastuerllosis and Contagious Bovine Pleuro Pneumonia. In

addition, Traypanosomasis occurred in all seasons compared to other diseases of the zone.

Table 13: Pair wise index and ranking for disease of dairy cows in different production systems

Diseases	Pastoral		Mixed crop- livestock	
	Index	Rank	Index	Rank
Trypanosomiasis	0.27	1	0.26	1
Pastuerllosis	0.23	2	0.24	2
CBPP	0.19	3	0.22	3
FMD	0.17	4	0.16	4
Internal and external parasites	0.14	5	0.12	5

1= most importance 5= least importance

### Constraints and Opportunities for Dairy Developments

Production constraints determine the state of dairy cattle production in the study areas. Some of the constraints mentioned by the farmers are feed, health, environmental factors, conflict, management and genotype. The interactions of these factors limit the efficiency at which genetic potential of a given animal species is being utilized. Farmers in all the study areas raised their livestock at subsistence level because of variety of

problem in the study areas. Generally, the major constraints identified by respondents in both pastoral and mixed crop– livestock production system are due to diseases contributing 43.3 and 33.3 per cent, respectively. Next to diseases, thieves 25% and absence of veterinary services 13.3 percent for pastoral and feed 23.3 % and thieves 15% for mixed crop- livestock, respectively, (Table 14). A chi-square test shows that there were no significant ( $p>0.05$ ) difference among the production systems.

Table 14: Major production constraints in pastoral and mixed crop- livestock production system

Production constraints	production systems					
	Pastoral (N=60)		Mixed crop- livestock (N=60)		Total (N=120)	
	Frequency	%	Frequency	%	Frequency	%
Diseases	26	43.3	20	33.3	46	38.30
Veterinary services	8	13.3	5	8.3	13	10.80
Water scarcity	1	1.70	2	3.30	3	2.50
Lack veterinary clinics	4	6.70	3	5.00	7	5.80
Feed and feeding	3	5.00	14	23.3	17	14.20
Thieves	15	25.0	9	15.00	26	20.00
Low producing animal	1	1.70	4	6.70	5	4.20
Extension services	2	3.30	3	5.00	5	4.20
<b>Total</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>	<b>120</b>	<b>100</b>

### IV. CONCLUSIONS AND RECCOMENDATIONS

The milk yield performance of cattle in the studied households was low and age at first calving seems to be extended as it is common for other indigenous cattle in Ethiopia. The calving interval was encouraging but still below the optimal level. The amount of milk production sale and milk price was higher in mixed crop–livestock

system than in pastoralists. This is due to better management and marketing access for dairy products and by products located in mixed crop–livestock system than those in pastoralists. In both production systems feeding of cattle was based on natural feed resources. The selected households depended highly on family labor in both pastoral and mixed crop-livestock system. In both the production system the animals are seriously infested by



diseases such as trypanosomiasis, Pastuerllosis, CBPP, FMD and parasites. Disease, thieves and veterinary services was regarded as the most important for dairy cattle production constraints prioritized by farmers residing in the study areas. Milk yield is the most important trait preferred by both mixed crop-livestock and pastoral milk producers, but farmers generally depend on informal sources of information and their own morphological markers to select animals for dairy production, obviously due to lack of record keeping practices.

Based on the above conclusions the following points are recommended:

- Production systems and selection based breeding objectives need to be defined in the context of the existing dairy production conditions and interest of local societies in the areas.
- It is recommended that policy makers and donors need to give due attention to improve access to market to assure the well being of pastoralists, this can be achieved through construction of road, market center, facilitating transportation service, expanding telecommunication service in pastoral areas and linking producers directly with market, thus pastoralists can benefit from the rapidly growing demand for dairy cattle products and by products.
- Transfer of knowledge and technology for integrated farming should be provided.
- Special attention should be given to the diseases mainly trypanosomiasis through conducting research on the epidemiology of the disease, extension and designing appropriate control measures in the areas.
- Development of proper markets and co-operatives societies for collection and marketing of milk in villages.
- Should be given knowledge of pastoral production system of marketing.
- Provide awareness and extension services for preservation of milk and provide necessary information for by products processing.

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#### REFERENCES

- [1] Abereham, H., 2009. Phenotypic characterization of Begait cattle breed and their traditional production system in western Zone of Tigray, Northern Ethiopia. MSc Thesis, Mekelle University, Mekelle, Ethiopia.
- [2] Azage T., and Alemu GW, 1998. Prospects for Peri-Urban Dairy Development in Ethiopia. In: Proceedings of the 5th National Conference of the Ethiopian Society of Animal Production (ESAP), May 1997, Addis Ababa, Ethiopia.
- [3] GPNRS (Gambella Peoples National Regional State). 2003. Gambella Regional land-use and Land allotment study. Amended draft final report, Vol. II. Yeshi-Ber Consult (YBC). Addis Ababa, Ethiopia.
- [4] Grandin, B.E., P.N. De Leeuw and M.De Souza, 1991. Labour and livestock management. An analysis of the livestock production system of Maasai pastoralists in eastern Kajiado district, Kenya. ILCA Systems study. International Livestock Center for Africa, Addis Ababa, Ethiopia. Pp.71-82.
- [5] IAR (Institute of Agricultural Research). 1990. Abobo research center progress report 1988-1989. IAR. Addis Ababa, Ethiopia.
- [6] IPS (Investment office of the Somalia regional state), 2000. Resource potential assessment and project identification study of the Somalia Region: Socioeconomics assessment. Investment office of the Somalia regional state. Research report. Vol.III. Somalia, Ethiopia. Pp.351.
- [7] Kahsaye, W., 2002. The Cultural Ecology of Pastoralism in Eritrea. A geographic Inquiry. A dissertation Submitted to the Graduate faculty of the Louisiana State University and Agricultural and Mechanical College. Ph.D. Department of Geography and Anthropology.
- [8] Kedija, H., 2007. Characterization of milk production systems and Opportunity for market orientation: A case study of Mieso District, Oromia Region, Ethiopia. MSc Thesis, Haramaya University, Haramaya, Ethiopia.
- [9] Lemma, F., Fekadu, B. and Hegde, P. B. 2005. Rural smallholder milk and dairy production, utilization and marketing systems in East Showa zone of Oromia. Participatory innovation and research: Lesson for livestock development. Proceedings of the 12<sup>th</sup> Annual conference of the Ethiopian Society of Animal Production (ESAP) held in Addis Ababa
- [10] Sintayehu Y., Fekadu B., Azage T .and G. Berhanu, 2008. Dairy production, processing and marketing systems of Shashemene, Dilla area, South Ethiopia, IPMS (Improving Productivity and Market Success) of Ethiopian Farmers Project Working Paper 9, ILRI (International Livestock Research Institute), Nairobi, Kenya, pp: 62.
- [11] SPSS (Statistical Procedures for Social Sciences), 2007. SPSS (Version 15.00) BI Survey tips. Statistical procedures for social sciences (SPSS) INC. Chicago, USA.
- [12] Tesfaye, M. 2008. Characterization of cattle milk and meat production, processing and marketing system in Metema district, Ethiopia. MSc Thesis, Hawassa University, Awassa, Ethiopia.
- [13] Yien D., 2014. Assessment of Hygienic Milk Production and Prevalence of Mastitis in Dairy Cow in Jikawo Woreda of Nuer Zone, Gambella Region, Ethiopia, MSc thesis, Addis Ababa University, College of Veterinary Medicine and Agriculture, Pp 4