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Reproductive and Lactation Performances of Dairy Cows in Mekoy Ketema, North Zone, Amhara Region, Ethiopia

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Abstract: The study was undertaken in Antsokia Gemza Woreda, Mekoy town, North Shoa Zone of Amhara regional state from August 2013 up to December 2013. The objective of the study to characterize the over all reproductive and lactation performances of dairy cows in Mekoy town and to understand their influences on production. The participatory rural appraisal (PRA) method was used to generate information during exploratory survey and 101 households were selected for formal survey by using random and purposive sampling technique and were interviewed. In the study area the estimated mean livestock holding per household were 6.96 ± 6.5 tropical livestock units (TLU). The overall average estimated lactation yield of local and cross bred dairy cows was found to be 521.86 ± 248.5 litres of which 500.76 ± 193.34 and 1297.5 ± 525.37 litres(n=151) for local cows and crossbred dairy cows respectively. The overall average estimated lactation length of both local and cross bred cows was 9.21 ± 2.58 months. The overall average estimated daily yield of local and cross bred dairy cows was (n=151) 1.864 ± 0.7 litres. The overall mean estimated average age at first calving was found to be (n=153) 48.74± 8.72 months. The overall mean calving interval of local and crossbred dairy cows was found to be 20.48 ± 8.2 months. The overall average reproductive efficiency of local and crossbred cows in Mekoy ketema was calculated as 55.48 ±17.26 percent.

Key words: Age First Calving · Calving Interval · Lactation Length · Reproductive Efficiency

INTRODUCTION

Ethiopia is one of the least developed countries in the world with per capita income of 130 US dollars [1]. Poverty and food insecurity are the two major problems in the country. Among the major factors behind the poor performance of Ethiopian agriculture is diminishing farm size; subsistence farming soil degradation inadequate and invariable rain fall land tenure insecurity weak agricultural research and extension systems imperfect agricultural market and poor infra structure [2].

Pertaining to the condition of Ethiopia the contribution of the sector to the country's gross domestic product (GDP) and export are 60% and 90% respectively [3]. Animal production plays significant role in the country's economy the livestock sub sector contributes approximately 12-15% to the GDP [4]. The country has the largest livestock population in Africa; some estimations indicate that 41.5million cattle [5].

Cattle contribute 70% of the total value of livestock out put however; as noted by [6] the Ethiopian cattle breeds are zebu breeds and their productivity was reported to be very low. Lack of efficient extension service; shortage of veterinary services; poor management practice among the stockowners; in adequate capital investment and low genetic potential of the indigenous stock for productive traits are among the many reasons that assumed to contribute the low level of productivity of livestock sub sector [7]. [8] reported that milk yield has remained extremely low with the national average of 1.09 litters / day /cow this is mainly due to feed shortage, disease and limited attempt at introducing the improved breeds.

Regardless of milk production extremely low, given the current number of milk cows (9 million) and lactation yield the projected demand supply variance for milk in urban sector is about 2.74 billion litters per annum, in order to fulfill the increasing demand at least consistent

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4% annul increase in milk production will be required [9]. Therefore; the aim of this study is to estimate (i) livestock holding (ii) lactation length (iii) lactation yield (iv) age at first calving (v) calving interval and (vi) reproductive efficiency of dairy cows in the area (vii) off-take rate (viii) major dairy production constraints in the study area.

MATERIALS AND METHODS

Study Area: The study had been under taken in north zone of Amhara regional state in Antsokia-Gemza woreda, pisant asscociations (PAs) town and its surrounding peasant association sites

Location and Climate of the Area: Mekoy town of located 350 kms north –East of Addis Ababa and 630 kms from university of Gondar through the way of Dessie- Gondar transport road The town is found at altitude range of 1400-1500m asl. Situated at 39.88° longitude and latitude of 10.5°.

The mean annual rain fall is 1148.88mm. The average minimum and maximum temperature is 14.4 and 28.7°C respectively. With, 55.2 percent of annual average relative humidity. The Woreda has a total land size of 48,809 hectare of which 36% hilly 40% plain 5.6% swampy 11% forest 7.4% others [10]. The agro-climate of the woreda is 11% dega,, 44% kolla and 45% woina-dega. The particular study site and its surrounding are included in the kola part of agro-climatic region of the.

The study was covered in four pisant associations (Pas), with a total of 101 households were interviewed for formal survey. All family members were involved during the diagnostic survey for gathering proper information particularly in lactation and reproductive performances of dairy cows. Information on live stocks were more precisely obtained from females than male households and all of the family members help each other to give the right information.

Sampling Procedures: By defining the boundary of a dairy shed based on the information collected during the informal diagnostic survey, the geographical distribution of these sampling units within the dairy shed will be established. Random samples selection with a given sampling intensity were used to select local dairy cow holders, cow, but due to small number of crossbred dairy cow holders the samples were preferably selected purposively, i.e. sample size using a sub-set of the population to meet desired criteria of [11].

Table 1: Sample size distribution used for formal survey and four were selected and interviewed

No	Name	Sample size
1	Atiko	26
2	Harbuwoldae	30
3	Ambowuhaa	15
4	Mekedesa	30
	Total	101 house holds (hh)

The methodology proposed were multipurpose single visit survey method a formal survey of a representative sample of dairy production units within the dairy shed. The sample size proposed was in the range 100-150 units [12]. Farmer-recall (over one year) techniques were used for collecting the production data.

From literature review and considering the cost, time and resource limitations a total of 101 households were considered which was adequate from four PAs for the formal survey interview. List of female and male households obtained from each PA's officials were used for random selection of the households for the formal interview. Random table were used for household selection. Hence, stratified proportionate random sampling or purposive sampling technique was used for the study.

Data Collection: Both exploratory and diagnostic survey was used to generate qualitative and quantitative data for the study. To have an overall view of the farming system, an exploratory survey was carried out using checklists to discuses with farmers. The (PRA) was used to generate information during exploratory survey. Moreover, a rapid survey technique with key-informant interview method was used. Based on the information generated through PRA, the questionnaires [11, 12] were used and record sheets developed for the formal interview /diagnostic survey. Before starting the actual formal survey, developed questionnaires were pre-tested for the suitability of the study. Field observations were taken of respondent farmers in the sampling area. Details on animals were gathered from owners' interview. The methods of reproductive and lactation parameter were taken from farmers recall over the last one year performances of the cows using the standard quationer.

Statistical Methods: The statistical analysis used in the study would vary depending on the type of variables and information obtained. However, the quantitative data were analyzed using descriptive statistics (percentage, mean comparison, standard deviation etc.).

Computer software such as Excel was used for data management and analysis respectively.

RESULTS

The study was undertaken in Antsokia Gemza Woreda, Mekoy town, North Shoa Zone of Amhara regional state from August 2013 up to December 2013. The participatory rural appraisal (PRA) method was used to generate information during exploratory survey and 101 households were selected.

Livestock Holding and Off-Take Rates in the Study Area: In the study area the estimated mean livestock holding per household were 6.96 ± 6.5 tropical livestock unit (TLU). In low land agro-climatic zones of Mekoy ketema, 41.59 percent do not sell their cattle and having off-take rates (number of animals sold) ranging from 2.7 to 57 percent.

Lactation Yield: The overall average estimated lactation yield of local and cross bred dairy cows was found to be 521.86 ± 248.5 of which 500.76 ± 193.34 liters were for local cows (n=151) and the mean lactation yield for crossbred cows was 1297.5 ± 525.37. Table 4 shows there were cows with a minimum yield of 70 liters up to 2100 liters lactation.

Lactation Length: The overall average estimated lactation length of both local and cross bred cows was 9.21 ± 2.58 months, of which local cows were 9.2 ± 2.6 months. The lactation length of Holstein Friesian –local cows crossbred of unknown blood level was 9.25 ± 1.299 months. Table 5 shows there were cows with lactation length of four to 18 months in the study area.

Daily Milk Yield: The overall average estimated daily milk yield of local and cross bred dairy cows was 1.864 ± 0.7 litres and for local cows was 1.79 ± 0.48 litres (n=151). The average daily yield of crossbred dairy cows was 4.6 ± 1.52 litres. Table 6 shows there were cows with daily yield of ranging from 0.5 to 6.4 litres/day.

Age at First Calving: The beginning of productive life the heifer is called age at first calving. The overall estimated average age at first calving was found to be 48.74± 8.72 months (n=153), of which 48.92 ± 8.7 months for local cows and 42 ± 6 months for cross bred cows, which was higher than the expected to be achieved. Table 7 shows there were cows with a maximum of age at first calving up to 72 months.

Table 2: Number of cows milked per house hold

Ref no	Number of cows milked	Number of hhhead	Percent
1	1	49	48.52
2	2	28	27.72
3	3	8	7.92
4	4	6	5.94
5	5	2	1.98
6	6	3	2.97
7	7	1	0.99
8	9	2	1.98
9	10	1	0.99
10	15	1	0.99

Table 3: Shows 48.5 percent of the households have only one milking cows

Ref no	Number of cows milked	Number of hhhead	Percent
1	1	49	48.52
2	2	28	27.72
3	3	8	7.92
4	4	6	5.94
5	5	2	1.98
6	6	3	2.97
7	7	1	0.99
8	9	2	1.98
9	10	1	0.99
10	15	1	0.99

Table 4: Average lactation yield of cows based on farmer's estimation in litters in Mekoy ketema

Genotype	N	Mean	SD	Minimum	Maximum
Local cows	147	500.76	193.34	70.2	1020
Cross bred	4	1297.5	525.37	720	2100
Average	151	521.86	248.5	70.2	2100

Table 5: Lactation lengths of local and crossbred dairy cows in Mekoy

No	Genotype	N	Mean	SD	Minimum	Maximum
1	Local cows	147	9.2	2.6	4	18
2	Cross bred	4	9.25	1.299	8	11
	Average	151	9.21	2.58	4	18

Table 6: Daily milk yield of dairy cows in (Mekoy) based on farmers response in litters

No	Genotype	N	Mean	SD	Minimum	Maximum
1	Local cows	147	1.79	0.48	0.585	3.4
2	Cross bred	4	4.6	1.52	3	6.37
	Average	151	1.868	0.7	0.585	6.37

Table 7: Ages at first calving of local and crossbred dairy cows in Mekoy ketema based on farmers' response

No	Genotype	N	Mean	SD	Minimum	Maximum
1	Local cows	149	48.92	8.7	36	72
2	Crossbreed	4	42	6	36	48
	Average	153	48.74	8.72	36	72

Calving Interval: The gap between two successive calving is called calving interval. The overall mean calving interval of local and crossbred dairy cows was found to

Fig. 1: Crossbred dairy cows in the study area

Table 8: The average estimated calving interval of dairy cows in Mekoy ketema

Genotype	N	Mean	SD	Minimum	Maximum
Local cows	126	20.56	8.17	12	48
Crossbred	4	17.75	3.71	15	24
Average	130	20.48	8.2	12	48

Table 9: Calculated reproductive efficiency of local and cross-bred dairy cows

Genotype	N	Mean	SD	Minimum	Maximum
Local cows	147	56	17.58	25	100
Cross bred	4	61.4875	15.13	45.45	83.83
Average	153	55.48	17.26	25	100

Table 10: Distribution of cattle per household and their status in the study area

No	N	PAs	Minimum	Maximum	Average	Off-take range
1	26	Atiko	2	18	5.42+10.55	0-57%
2	30	Mekedesa	3	45	10.2+7.8	0-43%
3	30	Harbuwoldae	3	71	16.6+14.16	0-30%
4	15	Ambowuhaa	2	23	7.47+5.7	0-57%
Total	101					

be 20.48 ± 8.2 months of which for local cows 20.56 ± 8.17 months and for crossbred 17.75 ± 3.71 months, the over all calving interval in the study area was prolonged and on the other hand, crossbred cows calving interval was shorter and better than local cows. Table 8 shows there were cows in the study area with ideal calving intervals (up to 12 months).

Reproductive Efficiency of Dairy Cows in the Study Area: The parameter which measures reproductive efficiency could be calculated, the information gathered from the dairy owners based on, the number of calves born, age of cow in months and age at first breeding in months of dairy cows.

$$\text{Reproductive efficiency (RE)} = \frac{12 \times \text{number of calves born}}{(\text{Age of cow in months} - \text{ages at first breeding in months}) + 3} X100$$

Fig. 2: The local types of dairy cattle in the study area

Fig. 3: Crossbred bull in the study area

Fig. 4: Local cows and her calves

Fig. 5: Livestock holding in the study area

The overall reproductive efficiency of local and crossbred cows in Mekoy ketema was calculated based on the age of the cow, age at first breeding and number of calves born. Based on this there were average reproductive efficiencies of 55. 48 ± 17.26 percent of which for local cows 56 ± 17.58 percent and for cross bred cows was 61.4875 ± 15.13 percent which shows the presence of wastages by half than the expected to be achieved. Table 9 shows there were cows up to 25 percent of reproductive efficiencies.

Table 10 shows there were some households with their livestock mortality rate of up to 79 percent.

The off-take rate (number of livestock sold) in the study area (atiko Atiko and ambowhaaAmbowhaa) was higher. The maximum off-take rate recorded in atiko Atiko was due to conversion of communal grazing area to agricultural cropland as a result farmers took measure to reduce the number of their animals by selling. The reason according to farmers' response was the un-availability of grazing area to hold larger number of livestock. Highest cattle mortality recorded in ambowha Ambowha according to farmers response was related to feed scarcity (79 percent in one household).

Major Constraints of Dairy Production in the Study Area: There was no Artificial insemination (AI) service until September 2013 in Mekoy ketema and the dominant cow genotype was local cows. Direct suckling was the dominant practice in the study area and there was no calf weaning when cows were milked. There was no purchased feed available for farmers but there was only crop residue and communal grazing were the known feed resources in the area. There was seasonal feed shortage in dry seasons due to deterioration of hay land and shortage of communal grazing areas. The prevalence of mastitis and abortion per household were 12.87 and 3.96 percent respectively. Calf mortality was encountered to 11.88 percent of the households. In the study area animal health problems prioritized by farmers and ranked in decreasing order were skin problems, gastro-intestinal parasites including liver fluke, blackleg and pneumonia and pasteurellosis. There were also reproductive diseases (problems) mastitis and abortions as well.

CONCLUSIONS

In study area the dominant genotype of milking cows was local, the lactation yield (500.6 liters) from local cows better than the national average (230 liters) this may be due to the type feed utilized in the area was crop and, sugarcane residues grazing aftermaths and communal grazing may contribute for better productivity. On the other hand the local cows in the area had greater variation in productivity, hence, this may, help for better selection from indigenous cows. When we come to lactation length the average was less by one to two months from the expected to be achieved this might be due to shortage of balanced feed and other management aspects. Daily milk yield (1.86 liters/day), for local cows and was also better than the national average (1.09 liters/day). Age at first calving also for local cows 49 months was a bit higher and is a reproductive wastage or almost double than that of the expected to be achieved and this might be a great loss which might me improved by providing better management.

Calving interval in the area was also 20.56 months for local cows which was a bit higher by 8 months than the expected to be achieved and this was might be loss in heat detection, lack of artificial insemination and shortage of feed.

The over all reproductive efficiency of local cows was around 55% which was less by half from the potential to be exploited this might be due to delayed in age at first calving, absence of supervision for heat detection and lack of AI technique in the area.

Following the fluctuated nutritional deficiency disease was also one of the major problems affecting livestock productivity. Due to nutritional scarcity 79% mortality rate was encountered in one household during the physical year which was evaluated on the formal surveillance generally disease problems prioritized by farmers and ranked in decreasing order were skin problems, gastrointestinal parasites, liver fluke, blackleg, pneumonia and pneumonic pasteurellosis regardless of trance boundary diseases.

The cattle off-take rate range from 2.7 to 57 due to feed shortage poverty and to use livestock to cover school children demand according to farmers response.

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