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A Survey on Breeding Practice, and Productive Performance of Simada Cattle in Tach Gayint District, Ethiopia

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ABSTRACT: The study was conducted to evaluate the breeding practices, milk yield and reproductive performance of Simada cattle in Tach Gaynit district. Two types of data viz. monitoring and survey was used. Primary data was collected from 180 respondents from six kebeles using a structured questionnaire and 120 Simada phenotype cows were monitored and followed for six months (October to March), 2014. The data was analyzed using the general linear model procedures of SAS (version 9.2). In the district the major cattle breeds kept by the farmers was local zebu cattle (Simada breed). In the study area, these breed were the main dairy cows for milk source. Milking was done twice a day with hand milking. From the total 35% of the respondents reported that they wash their hands and milk utensil before milking, as a hygienic practice. The overall average mean of NSC, AFS (months), AFC (months), CI (months), GL (months), and LL (days) were 1.13±0.03, 40.74±0.33, 49.77±0.33, 26.04±0.01, 281.12±0.33 and 203.54±1.40, respectively. Daily milk yield of Simada breed cow in the study area at the early, mid and late lactation was 2.07, 1.74 and 0.80 liters, respectively, with an overall milk yield of 1.54 liter. Stage of lactation and parity had shown a significant ($p<0.001$) effect on average daily milk yield. Milking time also significantly affected milk yield that morning time milk was higher than that of evening. Cattle production in the study area is mainly an integral part of mixed crop-livestock production system where they are kept for multiple functions. Consequently, training and awareness creation on milk handling and improving the reproductive performances of the breed had better be addressed.

Key words: Breeding practice, Reproductive performance, Simada cattle, Tach Gayint

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INTRODUCTION

In Ethiopia dairy production depends mainly on indigenous livestock genetic resources; more specifically on cattle that covers the largest contribution (81.2%) of the total national annual milk output [1]. Cattle are very important livestock species in the traditional mixed crop livestock production systems of Ethiopia by providing mainly draught power, a small amount of milk, meat usually when they retire and manure [2]. The Ethiopian indigenous cattle are well adapted to the tropical environment producing and reproducing under stresses of high degree of temperature, high disease prevalence and low level of nutritional status. However, they are said to be low in milk and meat production and their average lactation milk production ranges from 494–850 kg under optimum management [3].

The milk potential of these indigenous cattle of Ethiopia is estimated to be 1.32 liter /cow per day [4]. Milk production potential of indigenous cattle of Boran, Horro, Barca, Arsi and Fogera is low, ranging from 494 to 809 kg per lactation [5]. It has also been well documented that, in breeding schemes, the raise in milk production through selection is about 1% per year or 3-4 kg per lactation [6].

In Amhara region, there are many characterized and uncharacterized cattle breeds known for their milk production, beef and draught purposes. From such breeds Simada breed (described as Worie and Agew) is the one that performer better in its natural environment. The breed kept at Tach Gayint district due to its adaptation to harsh climatic conditions, its ability to better utilize the limited and poor quality feed resources and their tolerance to a range of disease found in production areas [7]. Despite the significant contribution of cattle to the area, limited attention is given to identify, characterize and conserve the diversity of the various classes of cattle. It is with this view and understanding that the present study was initiated to assess the breeding practice and reproductive performances of Simada cattle and to monitor and evaluate the milk yield of the breed in Tach Gayint district.

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MATERIALS AND METHODS

Description of the study area

The study was conducted in Tach Gayint district which is located in South Gondar Zone of Amhara Region. The district is located 200 km north east of Bahir Dar town, the regional capital. Tach Gayint district lies between 110 22' - 110 4' N Latitude and 280 19'_ 280 43' E longitudes. It has an altitude range of 1500-2800 mals; mean minimum and maximum annual temperature ranges from 13oc to 27oc. The mean minimum and maximum annual rainfall ranges from 900 to 1000mm per annum. There are three agro-ecological zones in the district, namely warm low land "(kola)" that covers 23.5%, humid mid-high land "(Woina Dega)" which covers 63.5% and wet high land "(Dega)", which covers 13% [8]. The district has fifteen rural Kebeles' and one town, Arb Gebeya. The district is characterized by erratic rainfall pattern, with rainfall distributed over the growing season (mid-June to end-September). The main feed resource of the area is grazing land, crop aftermath and crop residue. The average household land holding size is 0.94 ha, with small parcel of land for grazing [9].

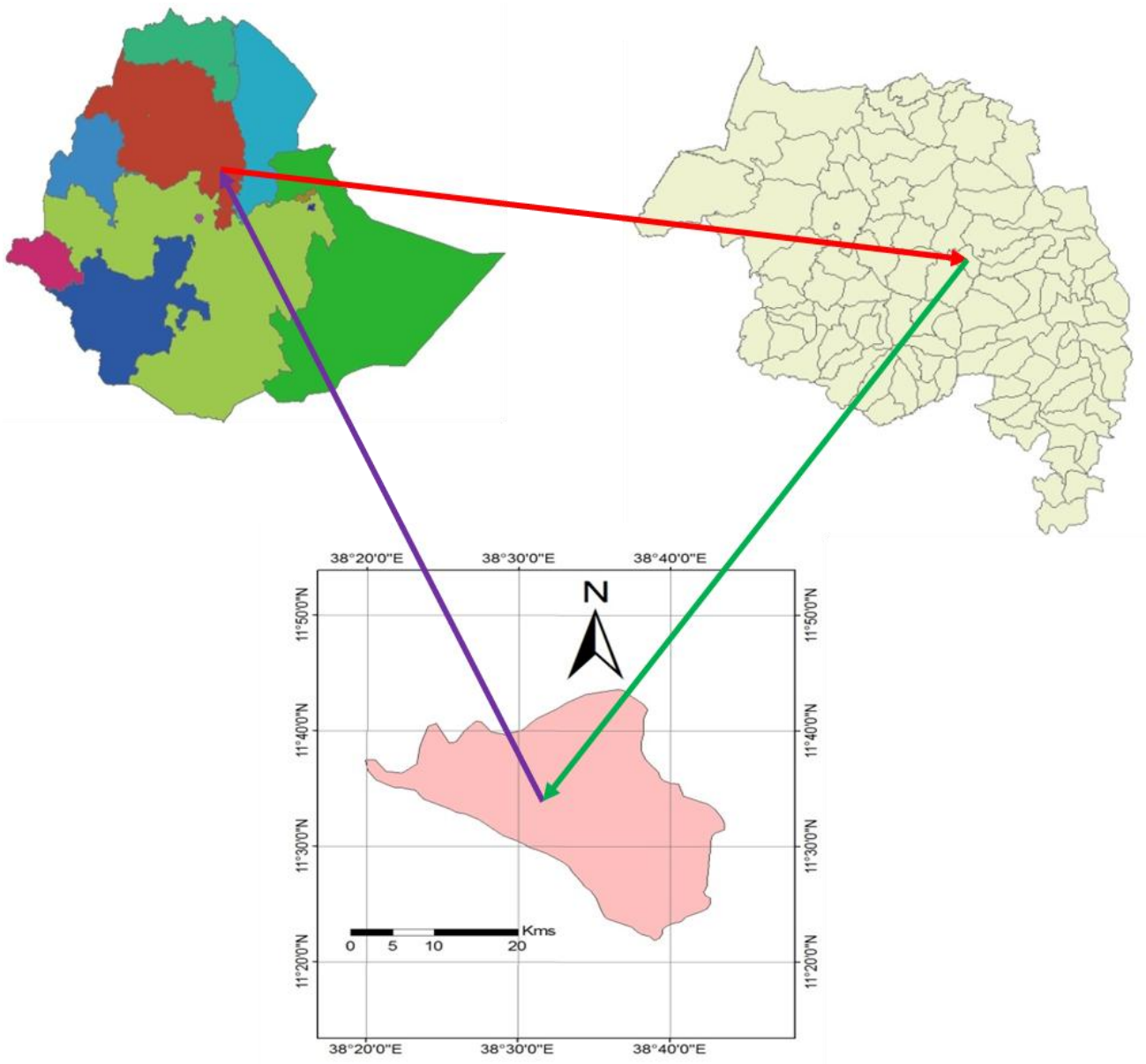

Figure 1. Map of the study district

Description of the Breed

Cattle of the study area are described as Simada cattle breed. The distribution of the breed extends from the low land to the high land (1500-3200 m.a.s.l) area of Lay Gayint, Tach Gayint, Simada districts of South Gondar administrative zone. The breed is also known as "Worie" and "Agew" and is preferred by the community because

of its relatively smaller body size and lower market price for buyers. It is also known to have a short calving interval and low space requirement. However; the breed does not tolerate the heavy fly burden and the swampy grazing land of the area [7]. Primary features of the breed are small body size; its color varies from black, black with white spot, and red, but other colors and combinations (red, roan, black-and-white) are common; smooth hair, small or absent naval flap, horns are short to moderate in length; hump is small to medium in size; they are mainly used for draught, and milk yield is quite low [10].

Figure 2. Description of Simada cattle breed

Method of sampling and data collection

Sampling and sample size: The working district was selected purposively based on its potential for Simada cattle population and its distribution. A total of 6 rural 'kebeles' were selected two kebele from lowland (500-1500m.a.s.l), three kebele from midland (1500-2300 m.a.s.l), and one kebele from the highland (2300-3200 m.a.s.l); and from each kebele 30 households who owned indigenous and lactating cows and a total of 180 household were used for the survey. The selection criteria for the monitoring data were purposive based on infra-structure, agro-ecology, farmer willingness, lactation stage and parity of the cow.

Data collection: Both primary and secondary data were collected for the study. Secondary data was collected from zonal administrative and NGO's, the districts offices and 'kebele' office. Primary data was collected using semi-structured questionnaire, checklists and field observations. The questioner is pre-tested before administration and training was given for kebele development agents and enumerators to collect the data. The data collected by the survey includes milk production, reproduction performance, and general cattle husbandry practices of the area. A total of three focus group discussions with 15 members from elders, youths, female households and kebele administrators were implemented to understand the origin and distribution of the breed, production system and overall management practices implemented in the district.

Monitoring of milk yield of individual cows was held for six months (from October to March) by trained enumerators living within the community that complete secondary education. A total of 126 days per each cow was monitored for morning and evening milk. A total of 120 lactating cows were classified by stage of lactation (early = 1-2months; mid = 3-4 months and late = 5-6 months) and parity (parity 1, 2, 3 and 4). Due to small number, cows above parity 5 are included and considered as parity five. Hand milking was practiced to milk cows. Daily cow milk yield (morning and evening) was measured by using calibrated plastic Jogs/ measuring cylinder/ for a period of three weeks/month.

Data Management and Statistical analysis

All data collected from the field were managed using MS-Excel (2007). And analysis was done by using the descriptive statistics of SPSS [11] software. The General Linear Model (GLM) procedure of SAS (12) was used to analyze the fixed effects on the economic traits used to be estimated. Agro-ecology (kola, woyena dega and dega), stage of lactation (early, mid and late lactation), parity of dam (parity 1, 2, 3, 4 and 5 (due to small number of animals at parity five, 8 animals were used) and age of the cow were used as fixed effect to estimate the milk yield

related parameters and agro-ecology and parity for reproductive performance traits. Reproductive performance traits analyzed were Age at first Service (AFS), Age at first Calving (AFC), and Calving Interval (CI) and milk yield traits analyzed were Daily Milk Yield (DMY), Lactation Milk Yield (LMY) and Lactation Length (LL). Tukey's HSD was used to separate the means based on their significant difference. The following model was used to analyze the data.

Model for milk yield traits (DMY, LMY and LL)

Yijklm = μ+Si+Pj+Zk+Al+eijklm

Where

Yijklm = mth record of ith stage of lactation, jth parity, kth agro-ecology and lth age of the cow

μ = the overall mean

Si = the ith effect of stage of lactation (early, mid and late)

Pj= the jth effect of Parity (1, 2, 3, 4 and 5)

Zk= the kth effect of agro-ecology (1, 2 and 3)

Al= the lth effect of age of the cow

eijklm = random error associated with each observation

RESULT AND DISCUSSION

Breeding Objective

As described by Zewdu [7] the production system of the study area is characterized by low input and high environment stress and little or no essential infrastructures. In the study area there is no performance or pedigree recording, due to lack of education on the importance and basics of record keeping. The involvement of the government and other stockholders like NGOs in genetic improvement of local indigenous cattle is very limited. The reason behind this might be due to lack of infrastructures such as AI service, lack of trained man power in the improvement program and other related problems.

The results of focus group discussion revealed that the major selection criteria for milking cows were based on long tail, large udder and teats and large body size, which allow to hold the fetus and produce more milk for the nourishment of the calve and to produce additional milk yield. Additionally, the farmers apply their indigenous knowledge in the selection and culling practices; they used criteria like low growth rate, long age of calving, low milk producer with low mothering ability and aggressive behaviors for culling practices.

Table 1. Bull preference for breeding practice in Tach Gayint district

Bull type	Number of respondents	Percent respondent
Simada	168	93.3
Cross	5	2.8
Unknown	7	3.9
Source of bull		
Own source	75	41.7
Neighbors'	90	50
Any one at the field	15	8.3

According to the respondents, 97.2% of them used natural mating (93.3% by selected bulls and 3.9% by unselected bull) and 2.8% use cross breeding method using artificial insemination. Natural mating was done in two ways viz. uncontrolled mating and controlled/group mating. In the former system heat detection is carried out by the bull and mating is made at the field; however in the later heat detection is made by cow owners and mating is done separately by the selected bull and group mating by letting the cow to join the herd of selected bull.

Due to the small body size of the breed, natural mating with the local bull is effective way of mating over the artificial insemination. Artificial insemination at the district is done at one site alone to mate cross breed cows produced around the district town, Arbe gebeya, with five birr per insemination. The insemination service is in line with the result of Belete [13] in Fogera district. The major constraints in the dissemination of AI service at Lay Gayint district were indicated at Table 2, below.

Table 2.1 Major constraints of AI in Tach Gayint district

Constraints	Number of respondents	Percentage
Lack of Knowledge	30	17.7
Limited AI service	79	44.8
Absence of interest for cross breeds	66	37.5
Total	175	100

Reproductive Performance traits

Age at first service: The average age at first service (AFS) of the study area was 40.74 months. The mean age at first service revealed in the study area is shorter than the mean of 42.48 months [20] in Bure district, 44±8 months (14) for Fogera heifer. The average effective age service of local bull in the study area is 44.4 months.

Age at first calving (AFC): First calving marks the beginning of a cow's productive life and influences both the productive and reproductive life of the female, directly through its effect on her lifetime calf crop and milk production and indirectly through its influence on the cost invested for upbringing [15, 16]. The average AFC of Simada cattle breed at Tach Gayint district was 49.8 months. This figure is smaller than the mean value of 53.75 months [17], 54.6±0.4 [14], 57.4 months for Bahir Dar and Mecha districts [18], 52.49±0.91 [19], 53.52 [20], 50.8±0.36 months (21) and 52.43±0.17 [22] for Metekel ranch and significantly higher than 32.8±0.9 months for Arsi [23], 47.6±0.77 months for Fogera [24], 43.77±4.2 months for local Zebu cows [25], 36.3±0.69 years [26] and 47.16±8.7 [27]. Reproductive performance of Simada cattle, especially age at first calving, is poor; this was probably due to poor management and breeding practice, low level of feeding, burden of diseases and parasite and problems in heat detection for timely mating. Similar reasons for prolonged age at first calving were reported by Haile-Mariam and Mekonnen [3], Addisu and Prabhakar [28], Getinet et al. [29].

Calving Interval: Extended calving interval is one of the major problems that reduce lifetime productivity of dairy herds [2]. However, calving interval is probably the best indicator of reproductive efficiency. The result of this study showed that the calving interval (CI) of Simada cattle was 26.04±0.01 months. Genetic factors, year and season of calving, nutrition and age of cow are known to have significant effects on calving interval [30]. Lower CI was reported by Mukassa-Mugrewa et al. [5] (25 months) for traditionally managed Ethiopian high land zebu cattle, 13.69 months [23], 18.6 months (14) for Fogera breed, 18.7 months [25], 16.01±0.49 months [19], 20.04 months for on farm performance of Fogera breed [31], 14 months for local cattle [32], 16.4 months for Ogaden cattle [29], 19.6 months [21], 19.4 months [22] for Fogera cattle at Metekel Fogera cattle conservation ranch, 23.16 months [26], 15.11 months and 14.4 months for Gondar and Mekelle local cows, respectively [33, 34]. This is difference might be due to poor management, environmental difference, difficulties in oestrous detection, and long days open.

Parity of the cow had a significant ($p<0.001$) effect on calving interval. The longest calving interval recorded was at the second parity and the lowest calving interval at the fourth parity. The reason for longer calving interval in younger cows might be due to high nutrient requirement for growth in addition to production and reproduction. The result is in line with the reported by Enyew et al. [23], Ababu et al. [35], Addisu and Hegde [28], Million et al. [25], Aynalem et al. [32], Getinet et al. [29] and Melaku et al. [21]. However, Haile-Mariam Mekonnen and Mekonnen [5] reported non-significant effect of parity on calving interval of cows

Number of service per conception: The average value for number of services per conception (NSC) for the study area was 1.13±0.03. This report is smaller than the mean value of 1.28±0.06 [21] reported in Fogera cattle at Metekel ranch, 1.54 ±0.69 [16] in North Gondar, 1.59 [20] in Bure district, 1.54 [14], 1.62 [36] for Fogera breeds at Andassa Livestock Research Center, and is higher than 1.11 reported for Barka by Haile-Mariam and Mekonnen [3]. The lower result for NSC might be because of matting was conducted at the field where bulls and cows graze together naturally.

Production traits

Gestation Length (GL): The GL is the period between the date of fertile service and the date of calving. This period is almost invariable within individual in a breed or type. Gestation length, which is more or less constant, varying slightly due to breed, calf sex, litter size, dam age, year, and month of calving, and little can be done to

significantly manipulate the gestation length [17, 24, 14 and 37]. The overall mean gestation length reported for this study was 281.12±0.33 days ranging from 265 to 292 days. This result is in comparison to the report of Azage et al. [38] for lowland local pure Zebu; however, the figure is higher than the finding of Enyew [39] reported for Arsi cattle, Haile-Mariam and Mekonnen [3] for Boran and Barka breeds. It is higher than 276.3±0.5 and 277.9±0.6 days estimated for Arsi and Zebu breed respectively [23] and comparable with 282.69±0.26 days [21] and 281.72± 0.14 days [22] for Fogera cattle at Metekel ranch.

Lactation length and average milk yield: According to the result, the overall average milk yield of Simada cattle was reported to be 1.25 liters with respective average early, mid and late lactation of 2.10, 1.13 and 0.53 liter whereas according to the monitoring data the overall average milk yield of the breed was 1.54 with respective early, mid and late lactation milk yield of 2.07, 1.74 and 0.80 liter. The difference in the overall milk yield between the monitoring and survey data was due to the nature of the respondents to respond the exact value of the yield and absence of data recording nature of the farmers. This result indicated the average daily milk yield of local cows was significantly lower than the average value of 4 liter reported by ILDP [40], 1.82 liter in Bure district [20] and comparable with average daily milk yield of local cows in the respective first and second lactations of 1.69 and 1.86 liter in North Gonder Zone [7], and 1.67±0.41liter [27]. The result of the present study was greater than the national average local cow milk yield per day of 1.32 liter [41]. As indicated from the focus group discussion, in general, the lower average daily milk yield per cow observed in this study might be due to shrinkage of grazing land due to traction and degradation that brings feed shortage, prevalence of disease, and poor genetic potential of the breeds for milk production by over standing of the harsh environment.

Lactation length (LL) is the time period through which a cow continues giving milk in one milking time. The overall average lactation length of Simada cattle at the study area was 203.54 days. This result was smaller than the average lactation length of local cows of 7.29 months at Meiso district [19] and 9.8 months in Bure district [20], 7.20±2.50 months in peri-urban area of Tigray region [26] and 9.13±2.63 months at Angolellantera district [27] and the lactation length of this result is higher than the national average, 6 months [4]. The low lactation length observed in this study, compared with other authors was lowered due to shortage of feed, poor management practices, small number of sample size, and difference in cattle production system followed in the district.

Milk yield production in monitoring data: The overall milk yield of the monitoring data was reported to be 1.54±0.002 liter (Table 3). Most of on-station findings on performance of indigenous cattle on milk and associated traits showed very low figures [35]. The milk production was significantly ($P< 0.001$) affected by parity of the cow, and milk yield is higher in the advancement of parity, which might be due to the improvement of udder physiology and advancement of mammary glands to produce more milk. Similarly, stage of lactation had a significant effect on morning, evening and total milk yield [Table 3] and the milk production has decreased with the advancement of lactation stage. This is controversial on the natural lactation stage curve that indicates the higher milk yield is at mid lactation; which might be due to special feeding system adopted by farmers for the first two months both for calf growth and additional milk production for human consumption. This result was comparable with average amount of cow milk yield/ head/day at first, second, third and overall mean value of 1.37±0.02 liter, 1.86±0.03 liter, 0.49±0.01 liter and 1.24 liter, respectively for local cows in Meiso district for [19], and is lower than 2.0, 1.12 and 0.6 liter for early, mid and late stage of lactation [42]. The overall result is also lower compared with the maximum partial daily milk yield of Fogera cattle breed at Andassa livestock research center, which was reported to be 2.14kg [43] and with a maximum milk yield of 2.79 liter for on-farm (Fogera district) level of Fogera cattle breed [31]. Notably, the lower result for milk yield of Simada cattle might be due to unfavorable environmental condition of climate, low standards of animal husbandry and prevalence of parasite and disease.

Agro-ecology is also had a significant effect on milk yield; mid land kebele (agro ecology) has better milk yield than the low land and the highland kebeles, which might be due to presence of optional grazing land and presence of additional feed staff from crop residue and crop aftermath.

Milk production for the monitoring data indicated that as age of the cow increases, there is also a considerable increment in daily milk yield up to 10 years of the cow age (Figure 3), which might be due to the maturity of physiological status of the mammary gland; and it becomes decline after 10 years of age, which might be attributed to the lowering of the cow efficiency in digestion, and lowering in the physiology of the cow in the

advancement of age. This result is also comparable with the findings of [19, 16, 44 and 45] those reported that the milk yield of the cow decreases with the advancement of age.

Table 3. Milk yield of Simada cattle at Tach Gayint district (Monitoring data)

Variable	N	MMY (Mean ± SE)	EMY (Mean ± SE)	TMY (Mean ± SE)
Overall Mean		0.92 ±0.002	0.62±0.002	1.54±0.002
Stage of lactation		**	***	***
Early	40	1.18±0.003a	0.90±0.003a	2.07±0.006a
Mid	40	1.01±0.003b	0.73±0.003b	1.75±0.006b
Late	40	0.56±0.002c	0.24±0.002c	0.80±0.005c
Parity		**	*	***
1	30	0.81±0.005c	0.55±0.005c	1.35±0.010c
2	30	0.91±0.005c	0.63±0.006c	1.54±0.011c
3	28	0.99±0.005b	0.66±0.006bc	1.65±0.011bc
4	24	0.97±0.006bc	0.67±0.006b	1.63±0.012b
5	8	1.15±0.006a	0.77±0.003a	1.92±0.058a
Agro-ecology		***	***	***
High land	40	0.93±0.007b	0.66±0.007b	1.59±0.013b
Low land	60	0.85±0.005c	0.52±0.005c	1.40±0.009c
Mid land	20	0.95±0.004a	0.68±0.004a	1.63±0.008a

N= number of observation; ***P<0.001; **P< 0.01; *P<0.05. Means with the same letter are not significantly different; MMY = Morning milk yield, EMM = Evening milk yield and TMY = Total milk yield and SE = Standard error

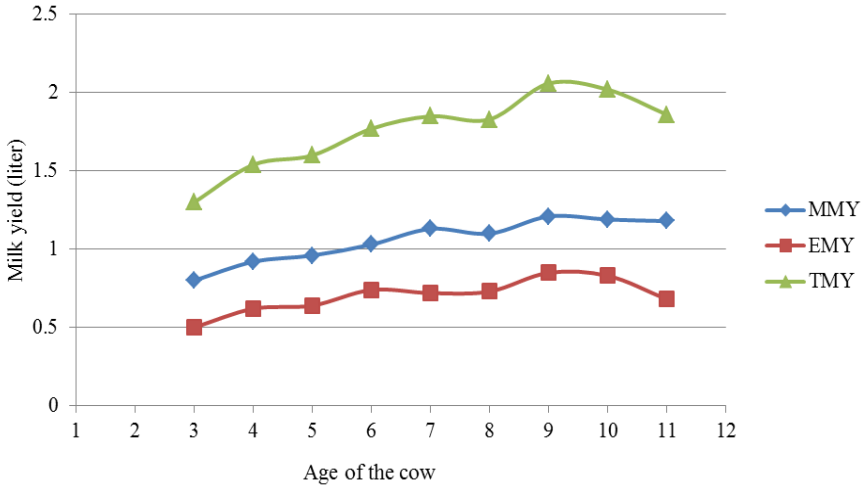

Figure 3. Milk yields of Simada cattle breed across age

CONCLUSION AND RECOMMENDATION

Milk production of the study area with Simada cattle breed is a subsidiary activity to support the income from crop production. The milk is used mainly for the calf nourishment and for feeding of children in the household; the small amount of milk left is collected for a week and processed to butter for selling. The reproductive performance observed in this study is lower compared with other breeds of the country, which is mainly due to absence of record, poor management practice (absence of supplementation, strategic vaccination and health follow up). Hand milking is the sole milking method in the study district; and during dry season, milking is done once a day and considerable milk is left for the calf. Indigenous knowledge was implemented to improve flavor, taste and quality and minimize spoilage of milk through smoking of the milk and milk utensils with different herbs and plants. To improve the production and productivity of the breed and the livelihood of the farmers keeping the breed, the following points are recommended.

- Awareness should be created among smallholder farmers about the importance of better management in terms of feeding, housing and breeding for improvement of cattle production and productivity.
- Genetic improvement of the breeds through controlled and strategic breeding should better be done to have additional milk yield for income generation.

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• Further studies should be carried out to identify the indigenous cattle population and general characteristics of the production system of the breed to design conservation and improvement strategy.

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