

Community Perception on Breed Selection and Feeding Practice among Small Holder Dairy Farmers in Tiyo District, Arsi Zone, Ethiopia

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Abstract

A cross-sectional questionnaire survey carried out at Tiyo district of Arsi zone from October 2015 up to April 2016. The objective of study includes assessing smallholder dairy farm reproductive performance and associated production problems. Data collected from selected four kebeles; in two agro-ecological zones namely, Dega and Woina Dega. Questionnaires subjected for two groups of household who own local and cross breeds. 384 informants who have at least one local or cross breed cow included in selection. Among the informants 65% of them have attended elementary school and followed by 15% illiterate and the remaining were diploma and degree holders. Local breeds kept by less educated farmers than educated ones. Feeding practice depends on season and learning status, where feeding practice significantly different ($p < 0.05$) between wet and dry season, and in higher educated groups, they use more concentrate feed regardless of the season. The overall average daily milk yield per cow, lactation length and calving interval of local breeds were 1.06 ± 0.65 liter, 10.29 ± 2.28 months and 3.1 ± 0 years, respectively. Whereas, cross breeds had 6.49 ± 1.65 liters, 16.79 ± 2.83 months and 2.63 ± 0.43 years, respectively. The difference in parameters were significant ($p < 0.05$) between local and cross breeds. Butter and cheese mostly supplied to local markets by local breed owners, whereas whole milk marketing well experienced by cross breeders. This may be associated with better milk production in cross breeders. On the other hand, informants have mentioned the problem of abortion, delay in first calving, long calving interval, mastitis and retained fetal membrane with the prevalence of 11.49%, 7.8%, 20.3%, 9.9%, 2.08% and 0.26%, respectively. In general, this study shown dairy cow management gap in the area. To reduce the problems noted, AI and veterinary services and forage and fodder development has to be improved. Awareness creation among farmers and stakeholders is also paramount important.

Keywords: Local; Cross breeds; Feeding practice; Education; Tiyo; Oromia; Ethiopia

Introduction

Cattle are an important livestock species in the traditional mixed crop- livestock production in Ethiopia by providing mainly drought power, milk, meat and manure. In dairy production cattle, camels, goats and sheep are the main livestock species that supply milk in the country, with cows making up 83.4% of the total annual milk of the country. The country's milk production level increased only by 1.6% and per capital production declined about 0.8% yearly during 1966-2001 [1].

Despite the presence of huge number of cattle population and favorable climate for livestock Production, current milk production is low. This is justified by low per capital milk production and increased import of milk and milk products. Like most developing countries, in Ethiopia there is an increase human population, urbanization and rising household incomes has become a driving force to increase livestock product demand, milk and Meat in particular. To meet the growing demand in Ethiopia milk production has to grow at least a rate of four percent yearly. Bridging the gap needs a suitable design and sustainable dairy development strategies; according to socio-economic, institutional and agro-ecological situation in the country [2,3].

The traditional (smallholder) milk production dominated by indigenous breeds, which accounts about 97-98% of the total annual milk production in the country. Over 85% of the milk produced consumed by rural households themselves and the remaining marketed outside [4]. Most of milk produced outside urban centers in the country processed into milk products at household level using traditional technologies. There is little to none experience of whole milk sale to the market [5].

Productive and reproductive performance of cattle influenced

by feed, genetics, disease and management practices. Feed and the nutritional quality of the available feeds are the most important reasons that determine the productivity of livestock. Livestock production throughout the world is dependent on various feed. The livestock production in Tigray region, as in many parts of Ethiopia, is traditional and dependent on crop residues, natural grazing and agro-industrial by-products [2].

Understanding feed and its nutritional quality are important to improve milk production and therefore strengthen food security. It provides proper knowledge to dairy producers and smallholder farmers. Therefore, the result of this study can have important contributions to individuals or institutions working in dairy development as well as dairy policy makers. In addition, the study will add knowledge and can serve as a springboard for the future research, development work and policy decision.

Therefore, the objectives of the study were to assess smallholder dairy farm reproduction performance, the type of breed kept and their feeding experience to obtain the maximum product as well as to identify major problem associated with dairy farm management.

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Material and Methods

Study area

The study conducted from October 2015 to April 2016 in Tiyo district. In Arsi zone, Oromia regional state about 175 km southeast of Addis Ababa at 6° 59' to 8° 49' N latitudes and 38° 41' to 40° 44' E longitudes. The altitude of the area ranges from 2500 to 3000 m.a.s.l. Tiyo district characterized by mid subtropical weather, with minimum and maximum temperature ranging from 8.4 to 22.6°C and the relative humidity ranging from 43 to 60%. The average rainfall is 2000 mm. The area has a bi modal rainfall, where short rainy season occur from March to April and long rainy season from July to October. Furthermore, according to Arsi Planning and Development Office, the area is densely populated, with livestock population of 85,893 cattle, 57,118 sheep, 10,725 goats, 7841 horses, 15,642 donkeys, 517 mules and 35,489 poultry. The farmers in the area practice mixed crop-livestock farming (personal observation).

Study subject

Farmers who own livestock, selected for questionnaire survey at different agro-ecological zone in Tiyo district. Equal opportunity has given to households who have kept local and cross breed dairy cows.

Sample size determination

A random sampling procedure employed to select sample kebeles and households for the study. The district first stratified as Dega (cold highland) and Woina Dega (midland) agro-ecologies. Out of 18 Kebeles in the district, 4 Kebeles randomly selected from each agro-ecology. The total number of informants required for the questionnaire survey determined based on the formula given by Trushfield for simple random sampling method [6].

$$n = \frac{1.96^2 (P_{exp} (1 - P_{exp}))}{d^2}$$

Where n is the required sample size, P_{exp} is the expected prevalence and d is the desired absolute precision. Number of households was calculated by taking the expected prevalence of 50% due to lack of previous similar study in the area. Therefore, 384 households used for questionnaire survey.

Study methodology

A structured questionnaire survey conducted on 384 informants to collect the required information focused on the household characteristics; reproduction, milk production; animal feed; and common health problems encountered on their cows in the area.

Data management and analysis

The quantitative data collected entered into Microsoft Excel spread sheet and summarized using descriptive statistics. Associations between assumed factors were compared using STATA 9 software. Analysis considered being significant when p-value is less than 0.05.

Results

Educational background of the informants

Among 384 interviewed those who had elementary educational background was dominant (65.36%) followed by illiterate group (15.1%)

and while those degree holder farmers were the least (2.08%). The remaining group falls in between as it was shown in Table 1.

Breed types owned by informants

Among the informants, who were illiterate and elementary school background had high proportion of local breed as compared to farmers who were high school, diploma and degree educational background. However, there was no significant difference (p>0.05) among farmers in selecting breed type. The proportion of Holstein cross and local breeds were almost equal throughout educational background as shown in Table 2.

Feeding style during wet and dry season according to educational status

Main feed provision in the area were crop residue like teff, barley and wheat straw; communal grazing and concentrate supplement like oilseed cake, wheat bran were common practice in the area. However, feeding style varies according to the season and individual farmer's income capacity.

During wet season all farmers use natural grazing when compared to that of crop residue and concentrate feeding with significant difference (p<0.05). They provide concentrate as supplement rather than as main source of feed in wet season. However, those degree holder farmers had no significant difference (p>0.05) in feeding crop residue, natural grazing and concentrate. Furthermore, during dry season all informants responded that crop residue used as the main source of feed (100%) followed by concentrate (37.5%) and natural grazing (5.7%). Feed provision had relatively different among farmers, where diploma and degree holders used more concentrate feed than natural grazing as shown in Table 3.

Daily milk yield, lactation length, calving interval and AI service

According to the informants average daily milk yield, lactation length and calving interval had significant difference (p<0.05) between local and cross breeds, where local breeds had low daily milk yield, short lactation length and long calving interval. On the other hand, AI service more practiced within cross breeds cows than local breeds. The overall

Educational status	Number of informants	Proportion
Illiterate	58	15.1%
Elementary	251	65.36%
High school	54	14.06%
Diploma	13	3.36%
Degree	8	2.08%
Total	384	100%

Table 1: Educational background of the farmers involved in small holder dairy farm at Tiyo district

Educational back ground	Respondent number	Local breed	Cross breed	P-value
Illiterate	58	28(48.3%)	30(51.7%)	0.99
Elementary	251	128(51.0%)	123(49%)	0.85
High school	54	34(63.0%)	20(37.0%)	0.11
Diploma	13	4(30.8%)	9(69.2%)	0.50
Degree	8	3(37.5%)	5(62.5%)	0.96
Total	384	197(51.3%)	187(48.7%)	0.68

Table 2: Educational background compared with breed types owned by the farmer.

Education status	n	Wet season				Dry season			
		Crop residue	Natural grazing	concentrate	P-value	Crop residue	Natural grazing	Concentrate	P-value
Illiterate	58	22(37.39%)	58(100%)	14(24.14%)	0.00	58(100%)	7(12.07%)	27(46.55%)	0.00
Elementary	251	42(16.7%)	251(100%)	23(9.2%)	0.00	251(100%)	12(4.78%)	84(33.47%)	0.00
High school	54	25(46.29%)	54(100%)	8(14.81%)	0.00	54(100%)	3(5.56%)	15(27.78%)	0.00
Diploma	13	12(92.31%)	6(46.16%)	10(76.92%)	0.02	13(100%)	0	12(92.31%)	0.00
Degree	8	8(100%)	7(87.5%)	7(87.5%)	0.50	8(100%)	0	6(95%)	0.00
Total	384	109(28.4)	376(97.9)	62(16.14)	0.00	384(100%)	22(5.7%)	144(37.5%)	0.00

Table 3: Feed provisions for dairy cows in different season based on educational status.

Breed	Number of informants	Mean \pm SD milk/day	Mean \pm SD LL (months)	Mean \pm SD CI (years)	AI user
Local	197	1.06 \pm 0.65	10.29 \pm 2.82	3.1 \pm 0	64(32.5%)
Cross	187	6.49 \pm 1.65	16.79 \pm 2.83	2.63 \pm 0	92(49.19%)
Total	384	3.70 \pm 2.99	13.5 \pm 3.97	2.8 \pm 0.43	156(40.5%)
	p-value	0.000	0.000	0.000	0.001

Table 4: Daily milk yield, lactation length, calving interval and AI service in selected Kebele of Tiyo district.

mean daily milk production, lactation length and calving interval shows lower than acceptable level as shown in Table 4.

Marketing practice of whole milk and milk products sale

In this study who have local breed had poor experience in selling whole milk, except four informants (2.3%), most of them (69.0%) had good experience in selling milk products like butter and cheese. Among the informants who owned cross breed 118(63.1%) practiced whole milk selling, whereas 185(98.9%) and 184(98.39%) of them had the experience of selling butter and cheese, respectively. There are group of informants who have good experience in marketing both whole milk and milk products. Problems associated with selling practice as described as mainly scarcity of milk and lack of market as complained by local animal owners as shown in Table 5.

Major reproductive problems reported during questionnaire survey

In the study area long calving interval (20.31%) was the most common problem of the animal owners than other problems. Besides this, abortion (11.46%), delay of first calving (7.81%), mastitis (9.89%), retained fetal membrane (2.08%) and uterine prolapse (0.26%) also mentioned as shown in Table 6.

Discussion

The educational level attain by most informants were low which falls between illiterate and primary school. As reported by Asaminew, low-level education can have a negative effect to develop dairy farm [7]. Less educated farmers experienced by poor usage of dairy technology such as artificial insemination, cultivation of improved forage crops and access to veterinary services. The percentage of illiteracy (15.1%) in this study was lower than reported by Tesfaye in Metema (45%) and Fisseha in the Bure district (50%) [8,9]. As showed in the result, most of informants in the study area had attended certain education. The study shows education is growing in the area, which contributes for a better agricultural practices and wise usage of scarce agricultural resources. In addition, it is a good opportunity to facilitate extension services for rural development and transferring technology.

In Ethiopia, natural grazing and browsing fallow lands, *Enset ventricosum* and stubble grazing following the crop harvest was the

major feed resources [10]. The major feed sources for dairy cattle in the study area include natural grazing, concentrate and crop residues. Most of the informants in the study area use combinations of different feed resources based on availability. Natural grazing had significantly utilized ($p < 0.05$) compared with crop residue and concentrate during wet season because of rainy season in which grass was excessively available for their cattle. Degree holder informants used both crop residue and concentrate during wet season for their cow. This may be due to the absence of land so they keep indoor and supplement concentrate to have high milk production. The effort made to improve utilizing crop residues and cultivation of improved forage crops on private lands not practiced by many of the informant. The entire dairy producers keep their cattle under poor management conditions and provide little supplementary feed and health care similar to earlier reports in central highlands of Ethiopia [11].

According to the informants average daily milk yield had significant difference ($p < 0.05$) between local and cross breeds. The daily milk yield of local breed was 1.06 liters and that of crossbreed was 6.49 liters. This was below the values 1.26 liters and 11.53 liters of milk/cow/day for local and cross breed respectively as reported by Ahmed, respectively [12]. The amount of milk produced per day/cow by local cows in the study was also lower than the value 2.8 kg milk/head/day reported for local Zebu breed by Bereda [5]. This may be due to the reason that the owners didn't give sufficient supplementary feed other than natural grazing and crop residue, like as those of cross breed owned informants. This result was also lower than the report by Seifu where average of 2 liters for local breed and 16.5 liters for cross breed indicated [13]. This may be due to management difference where in this study almost all cow owners practice extensive farming system. However, the daily milk yield of crossbred cows observed in the present study is higher than the value 5.6 kg/head/day reported by Mukasa for crossbred cows in Arsi highlands of Ethiopia [14]. High daily milk yield observed in crossbred cows in the present study might be attributed to the high blood level or better management used in Tiyo district.

In addition, values of lactation length were recorded in months since most of the farmers didn't have records and it was difficult for them to recall the lactation length in days. Based on the informants answer lactation length had significant difference ($p < 0.05$) between local and cross breeds. The lactation length of local cows was 10.29 months and that of crossbred

Variables	Local breed	Cross breed
Milk selling practice	4(2.03%)	118(63.1%)
Butter selling practice	136(69.04%)	185(98.9%)
Cheese selling practice	128(64.97%)	184(98.39%)
Reason for not selling milk (%)		
Lack of market	3(1.55%)	52(75.36%)
Scarcity of milk	187(96.89%)	19 (27.53%)
Cultural restriction	0	

Table 5: Marketing practice of whole milk and milk products among respondents and associated constraints.

Problems	Number of informants	prevalence
Abortion	44	11.46%
Delay of first calving	30	7.8%
Long calving interval	78	20.3%
Mastitis	38	9.89%
Retained fetal membrane	8	2.08%
Uterine prolapse	1	0.26%

Table 6: Major reproductive problems reported by informants.

cows was 16.79 months. These figures are above the national averages for lactation length of local cows i.e., 7.85 months [14] and crossbreed cows had 9.16 months by Ahmed [12]. In this study lactation length in local breed was almost the same with that of Bereda [5].

The calving interval is a period between two consecutive parturitions and should ideally be about 12 to 13 months. The calving interval (CI) for local cows was found to be 3.1 years and that of crossbred cows was 2.63 years, hence it had significant difference ($p < 0.05$) between local and cross breeds. These values were longer than 2.08 years calving interval in highland local breeds and 1.28 years calving interval in crosses [14]. Short lactation length and long calving interval observed might have been attributed to the poor management conditions and poor plain nutrition of the cows in the study area. Plain nutrition is a major factor that determines the productive and reproductive performances of dairy cows [12].

During study period, most of dairy farmers who own cross breed in the districts practice the informal marketing system, where they sold their products to organization called Idget Behibret. However, whole sale of fresh milk was not a common practice especially those rearing local breed. Among different reasons, inefficient milk production (96.89%) and lack of market (1.55%) were the most common reasons incriminated by the informants. The proportion was higher than situation that was reported in Eastern Wollega where 21.3% of the women did not sell fresh milk mainly due to scarcity of milk, but the proportion of cultural restriction toward selling of fresh milk was dominant in Eastern Wollega [15]. In this study 63.1%, 98.9%, 98.39% of households with cross breed have milk, butter and cheese selling practice, respectively. They sell high proportion of butter and cheese than reported by Birhan [3]. Whereas, 2.03%, 69.4% and 64.97% of house hold who rear local breed have experience of milk, butter and cheese selling practice, respectively which was higher than that was reported by Bereda [5]. The reason for this variation was cross breed cows has genetically had the ability to produce more milk than local breed cows. Among the dairy products most commonly marketed by smallholder dairy farmers in study area were cheese and traditional butter than whole milk.

The result of current study indicated that long calving interval, abortion and mastitis found to be the major common problems in the area; followed by delay of first calving, retained fetal membrane and

uterine prolapse. The prevalence of abortion in this study was higher than 1.0%, 2.23%, 5.96% and 6.3% as reported by Gashew et al., Gizaw, Berihu and Shiferaw et al. [16-19]. These results suggest that breed, geographic location, case definition and procedural differences are all source of difference in prevalence of abortion. The prevalence of RFM in this study was lower than reported with the range of 11.9% -24% by Gashew and Tekelye [16,20]. The variation in the prevalence of RFM may be attributed to variation in predisposing factors including nutritional status and management.

Conclusion and Recommendation

Milk production in Tiyo district is low; despite its great role in nutritive value and income generation. Indigenous local breed cows are dominantly owned by illiterate and elementary background than cross breed cows, which are characterized by low milk production. Improving such low milk production in local breed through AI service is severely constrained by genetic factor, lack of awareness among farmers, inadequate AI service and feed shortage. Inadequate veterinary services, shortage of land for forage production are the major problem. Marketing of dairy products is also restricted to butter and cheese for those informants rearing local breed. Milk and milk product collection center or co-operatives didn't located at different site to be accessible. Therefore, according to this study farmers are not profitable from the livestock sector, hence government and related development partners should work with the community to overcome the constraints and commercialize the sector to benefit the community.

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