Assessment on Challenges of Dairy Production and Marketing in Gondar Town, North West Ethiopia

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Abstract: Various constraints for dairy production lead low productivity and production. A cross sectional study was conducted from November 2015 to April 2016, in Gondar town of Amhara Regional State with the objective of assessing challenges of dairy farm production, marketing and demand for dairy products in different herd size based on questionnaire surveys. A total of 151 dairy farms were selected from 300 dairy farms by systematic random sampling method both in small, medium and large scales. Data were collected from the selected farms using semi structured questionnaires and analyzed using multiple responses and descriptive statistics. From the respondents, 84.1% faced with feed problems and there were no statically significant variations ($p > 0.05$) between the herd size and animal feed problems. Similarly 60.8% of respondents who sold milk and milk products faced market problems and were statically significant variation ($p < 0.05$) between the herd size and market problems. On the other hand, inadequate extension and training services (55.0%), lack of education and consultation (62.9%) and inadequate research and information exchange system (51.0%) were dairy extension constraints and statically significant difference between herd sizes of the farm ($p < 0.05$), and 74.8% of the respondents faced with dairy health problems, mastitis (26%) was cited as the most important disease. The high prevalence of reproductive problems were found (58.9%), in which repeat breeder (29.6%) was the most problem and there was statically significance variations among herd size ($p < 0.05$). Most milk products were used for selling (51.6%) and there were statically significance variations ($p < 0.05$) between herd size and selling and processing. Whole milk (61.5%) was the most selling milk products and statically significance ($p < 0.05$) except whole milk. The study showed that there were various constraints of dairy production and high demand for dairy products in the study area. Therefore, Government should give attention on feed processing technology and adequate space for future expansion of dairy production and marketing linkage between the producer and consumer of milk products should be created and developed.

Keywords: Challenges; Dairy farm; Demands; Gondar; Market; Milk products

1. Introduction

Ethiopia holds the largest cattle population in Africa estimated at about 56.71 million heads of cattle, of which 10 million is dairy cows (CSA, 2014). Despite the large dairy cattle population of Ethiopia, the per capita milk consumption in Ethiopia 18.68 liters is very low as compared to the global average of 100 liters and even far below the average for Africa, 27 kg per year (CSA, 2008).

Livestock production constitutes one of the principal means of achieving improved living standard in many regions of the developing world. The cattle populations are well adapted to the tropical environment producing and reproducing under stress of high degree of temperature, high diseases prevalence and low level of nutritional states. Livestock production in Ethiopia has been mainly smallholder subsistence farming with animals having multipurpose use and being managed in a traditional way (MOA, 2013).

Agriculture (mainly crop and livestock production) is the mainstay of the Ethiopian economy, employing approximately 85% of the total population. Livestock production accounts for approximately 30% of the total agricultural GDP and 16% of national foreign currency earrings. Despite the huge number of cattle and their economic importance, the productivity is low due to the challenges of disease, nutrition, poor management, and health problem, lack of infrastructure and lack of veterinary service provision. For the intensive as well as extensive dairy farms, it is characteristic in both tropical and temperate regions that the animals which graze relatively near to the milking area or the dairy-lot are given feed purchased from the surrounding area (Yoseph, 2000).

The goal of every dairy management team should be to maximize the efficiency of high producing dairy cows so that profitability will increase. Dairying as a component of livestock production is an important economic activity in Sub-Saharan Africa. In order to improve the low productivity of local cattle, selection of the most promising breeds and crossbreeding of these indigenous breed with high producing exotic cattle has been considered as a practical solution. The productivity of dairy cattle breeds depends mainly on their reproductive performance and efficiency of service per conception (Tadesse and Dessie, 2003).

Ethiopia, despite the huge livestock population, milk production is very low. In Ethiopia, urban and peri-urban dairy production systems are emerging as an important component of the milk production system. This system is contributing immensely towards filling in the large demand-supply gap for milk and milk products in urban centers, where consumption of milk and milk products are remarkably high (Ketema, 2000).

Dairying is one of the livestock productions practiced almost all over the world including Ethiopia, involving a vast number of small, medium, or large-sized, subsistence or market-oriented farms. The difference between large and smallholder farms is mainly determined by herd size (Chagunda *et al.*, 2006). Large scale farms keep large herds of cross breed and involve high inputs in terms of land, labor, housing, and feed and health management. The main source of feed is both home produced or purchased hay; and the primary objective is to get additional cash income from milk sale (Emebet and Zeleke, 2008).

Despite the rapid growth, the small holder dairy sector is faced with several challenges. These include limited genetic resources, inadequate veterinary service provision, poor management, inadequate animal feed resources, reproductive challenges and market related challenges. These challenges have a negative impact on milk productivity and reproduction (Hurise and Eshetu, 2002). The general objective of this research was therefore; to assess the challenges of dairy production and marketing in small, medium and large scale of dairy farms in Gondar town with specific aim of identifying the challenges of dairy production and marketing and estimating the demand for dairy products.

2. Materials and Methods
2.1. Study area
The study was conducted in Gondar town dairy farms, which are located Northwest part of Ethiopia in Amhara regional state. It is located at latitude, longitude, altitude of 12.3-13.8°N, 35.3-35.7°E and 2200 mean sea level respectively. The annual mean minimum and maximum temperature of the area vary between 12-17°C and 22-30°C, respectively (CSA, 2008).

2.2. Study population
Based on the grouping system made by ILRI, (1996), which categorized the urban dairy production system based on cow herd size in to small, medium and large scale production systems, these were Small Scale Dairy Farm (SSDF), Medium Scale Dairy Farm (MSDF) and Large Scale Dairy Farm (LSDF) having, 1 to 2, 3 to 10 and 11 and above dairy cows respectively. The lists of dairy farms were acquired from the urban agricultural development office at the beginning of the study. The numbers of dairy farms were 300 in all scales of dairy farms in the studying area which are kept in different management systems.

2.3. Study design
Cross-sectional study design was used from November 2015 to April 2016 across the small, medium and large scale dairy farms in the study area and data collection questionnaire format was developed and used (Annex 1). Data were collected based on the objectives of the research and the sample farms were visited once in order to acquire information on the challenges of dairy production, marketing and demands of dairy products in Gondar town.

2.4. Sampling technique, sample size and data collection
In order to assess the challenges of dairy production and marketing in the study area, a systematic random sampling technique was used to select dairy farms from the list of farms in the study area and were assessed through questionnaire based survey, the questionnaire were checked for clarity of the questions prior the interview, respondents were briefed to the objective of the study. Following that, actual structured questionnaire with two separate parts were used by translating in to Amharic version (Annexes 1) and presented. Then a total of 151 dairy farms (respondents) were selected and interviewed in both small, medium large scale dairy farms for the investigation of constraints of dairy farms and recorded. The survey data were managed in such a way that the qualitative variables were used during the study in studying area.

2.5. Data analysis
Data collected from cross-sectional questionnaire survey study were managed in such a way that the qualitative variables were used during the study. The questionnaire data was entered in to Microsoft excels software's and also coded for analysis. Descriptive statistics and multiple responses were used to describe the study dairy farms with respect to the challenges of dairy farms, marketing and demands of dairy products; for analysis of the data Statistical Package for Social Science (SPSS) (version 20) was used. In this Chi-

square test (χ^2), multiple responses were used. A probability of p<0.05 will be set as the significant level and the confidence interval (CI) will be set at 95%.

3. Results

A total of 151 dairy farms (respondents) were interviewed for the assessments of challenges on dairy production, marketing and demands of dairy products in the studying area. The farms were classified in to small, medium and large based on their herd size. That is, dairy farms with 1-2 cows were categorized as small scale, 3-10 cows as medium while those with ≥11 were classified as large scale dairy farms are listed below (Table 1).

3.1. Major feed resources

Data were collected for the feed resources of dairy farm production in the studying area in all scales of dairy farms were shown below (Table 2).

Table 1: **Herd size, housing and feeding of dairy farms in the studying area.**

variable		N	%
Herd size	Small	59	39.1%
	Medium	73	48.3%
	Large	19	12.6%
Housing	Mixed in corral	41	27.2%
	Separate in corral	12	7.9%
	Mixed in barn	67	44.4%
	Separate in barn	21	13.9%
	Mix with people	10	6.6%
Feeding	Only grazing	3	2.0%
	Only stall feed	110	72.8%
	Both	38	25.2%

Table 2: **Major feed resources in different herd size.**

Feed resources		Herd size		
	SSDF	MSDF	LSDF	Total
crop residue	15(3.1%)	22(4.5%)	3(0.6%)	40(8.2%)
Industrial-by products	8(1.6%)	28(5.7%)	17(3.5%)	53(10.8%)
Pasture and hay	57(11.7%)	72(14.7%)	19(3.9%)	148(30.3%)
Forage and silage	0(0%)	1(0.2%)	3(0.6%)	4(0.8%)
brewery	26(5.3%)	56(11.5%)	19(3.9%)	101(20.7%)
Oil seed cakes	25(5.1%)	39(8.0%)	17(3.5%)	81(16.6%)
Others	32(6.5%)	26(5.3%)	4(0.8%)	62(12.7%)
Total	163(33.3%	244(49.9%)	82 (16.8%)	N (489(100%)

N= No. of responses, SSDF=Small scale dairy farm, MSDF= Medium scale dairy farm
LSDF= Large scale dairy farm

Table 3: **Milk marketing constraints in the studying area in relation to herd size.**

Market problems	Herd size			
	SSDF	MSDF	LSDF	Total
Market distance	9(4.8%)	9(4.8%)	4(2.1%)	22(11.7%)
Seasonal fluctuation	18(9.5%)	33(17.5%)	14(7.4%)	65(34.4%)
No market access	12(6.3%)	24(12.7%)	11(5.8%)	47(24.9%)
Milk spoilage	9(4.8%)	16(8.5%)	10(5.3%)	35(18.5%)
High cost transport	1(0.5%)	2(1.1%)	3(1.6%)	6(3.2%)
Less price and less quality	9(4.8%)	4(2.1%)	1(0.5%)	14(7.4%)
Total	58(30.7%)	88(46.6%)	43(22.8%)	N (189(100%)

χ^2=8.137, P=0.017, N= No. of responses, SSDF=Small scale dairy farm, MSDF= Medium scale dairy farm and LSDF= Large scale dairy farm

3.2. Milk consumption and marketing System

Milk consumption pattern: Majority of the respondents were used whole milk (61.5%) for selling (51.6%) to the consumers to individuals (52.9%) and 27.8% traders respectively in the studying area. Milk marketing constraints: A total 189 responses were collected about marketing problems due to multiple responses, as indicated in the (Table 3) below, the

major constraints for milk marketing as cited by the producers in study area were seasonal fluctuation 65(34.4%) and no market access 47(24.9%) were the major challenges and there were statically significant difference (p<0.05) between production systems of the herd size and market problem.

3.3. Constraints to dairy production

Cattle breeding problems: data were also collected for cattle breeds and methods of breeding in the studying area were listed as in figure below.

Most dairy farm owners used artificial insemination for breeding purposes; there were some factors that forced dairy farms used bull as breeding purposes, which were 4(2.4%) inappropriate infrastructure, 25(15.2%) managerial and financial problems, 35(21.2%) inefficient heat detection, 41(24.8%) improper timing of insemination, 32(19.4%) very small numbers of AI technician and 28(17%) unwillingness of AI technicians'. Of which the responses 41(24.8%) improper timing of insemination were the most common factors that leads low genetic improved of dairy cows.

Dairy feed problems: As shown in Table 4 below, the major reasons for shortage of animal feed resources as indicated by the respondents were high in price 103 (31.0%) followed by inadequate feed 91 (27.4%%) were listed in different herd size of the dairy farm production, and there were no significant variations (P> 0.05) between the herd size and animal feed problems.
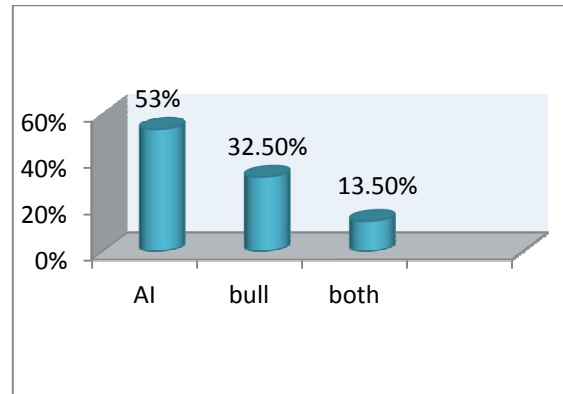
Figure 1: breeding methods
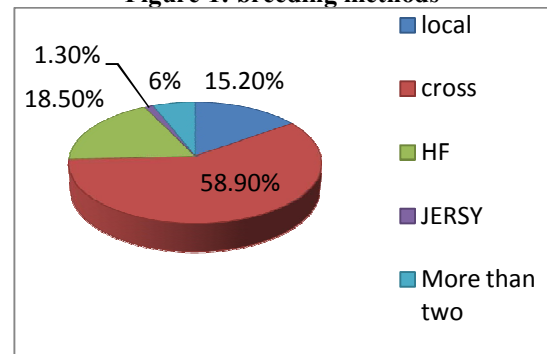
Figure 2: cattle breeds of the dairy farms in the study area

Table 4: **The major reasons for shortage of animal feed resources in the study area**

Feed shortage		Herd size		
	SSDF	MSDF	LSDF	To Total
inadequate feed	35(10.5%)	41(12.3%)	115(4.5%)	91(27.4%)
Poor pasture development	23(6.9%)	35(10.5%)	11(3.3%)	69(20.8%)
high in price	43(13.0%)	47(14.2%)	13(3.9%)	103(31.0%)
lack of grazing land	21(6.3%)	37(11.2%)	11(3.3%)	69(20.8%)
Total	**122(36.7%)**	**160(48.2%)**	**50(15.1%)**	**N (332(100%)**

χ^2=0.781, p=0.677 and N= No. of responses, SSDF=Small scale dairy farm, MSDF= Medium scale dairy farm and LSDF= Large scale dairy farm

Animal health problems: Out of the total 289 health problem responses were, ectoparasites 45(15.6%), Lumpy skin diseases 31(10.7%), lameness 47(16.3%), mastitis 75(26.0%), hoof and leg problem 19(6.6%), Foot and mouth diseases 8(2.8%), pneumonia 44(15.2%) and other disease 20(6.9%). Mastitis was cited as the most important disease in dairy production systems. There were no significant (P> 0.05) variations between the herd size and reasons occurrence of animal health problems shown below (Table 5).

Table 5: **Reasons for occurrence of dairy cattle health problems in Gondar town.**

Reasons of occurrences		Herd size		
	SSDF	MSDF	LSDF	Total
Inadequate animal health services	19(11.9%)	16(10.1%)	6(3.8%)	41(25.8%)
Un available diagnostic services	16(10.1%)	22(13.8%)	10(6.3%)	48(30.2%)
High cost of drug	2(1.3%)	6(3.8%)	3(1.9%)	11(6.9%)
Lack of veterinarians	2(1.3%)	13(8.2%)	3(1.9%)	18(11.3%)
Lack of budget	17(10.7%)	14(8.8%)	10(6.3%)	41(25.8%)
Total	**56(35.2%)**	**71(44.7%)**	**32(20.1%)**	**N (159(100%)**

χ^2=1.046, p= 0.593, N= No. of responses

Dairy extension service problems: Reasons for non participation on research and information exchange system for dairy production were (51.0%). Of which, 29(19.9%) unorganized information system, 44(30.1%) lack of new technology, 33(22.6%) weak linkage between research and 40(27.4%) weak linkage between extension and technology. There was statistically significance difference between herd size and research and information exchange system for dairy production (χ^2=30.527 and p<0.05, i.e. 0.000).

Study was also conducted to assess the influence of herd size on the constraints of extension and training services and education and consultation program of dairy farm production and revealed that there was statically significant difference between herd sizes (χ^2=24.865, 10.550 and p<0.05) with frequency of 55%, 62.9% extension and training services and education and consultation constraints of dairy production in herd size respectively.

Table 6: Reasons of extension and training services and education and consultation problems

Dairy extension problems	Herd size		
	SSDF	MSDF	LSDF / Total
No information to improve production	24(13.4%)	17(9.5%)	1(0.6%) / 42(23.5%)
No advice	26(14.5%)	21(11.7%)	2(1.1%) / 49(27.4%)
Inadequate extension and training	18(10%)	19(10.6%)	1(0.6%) / 38(21.2%)
Lack of milk handling	23(12.8%)	25(14.0%)	2(1.1%) / 50(27.9%)
Total	91(50.8%)	82(45.8%)	6(3.4%)/N (179)(100%)
Shortage of qualified personnel	25(17.9%)	14(10.0%)	1(0.7%) / 40(28.6%)
Absence of forums	28(20.0%)	32(22.9%)	6(4.3%) / 66(47.1%)
Miss understanding of production	19(13.6%)	15(10.7%)	0(0%) / 34(24.3%)
Total	**72(51.4%)**	**61(43.6%)**	**7(5%) / N (140(100%)**

χ^2=24.865, p=0.00, and, χ^2=10.550, p=0.005 and N= No. of responses

Reproductive problems: Out of the total reproductive problems interviewed, 58(29.6%) repeated breeder and 50(25.5%). Retained placenta was the major reproductive problems in the study area.

The study found that there were statically significance between herd size and reproductive problems (p<0.05) indicated below (table 7).

Table 7: Reproductive problem in different scale of dairy farms

Reproductive problem	Herd size				
	SSDF	MSDF	LSDF	Total	
Sterility	4(2.1%)	9(4.6%)	3(1.5%)	16(8.2%)	
Abortion	5(2.6%)	13(6.6%)	9(4.6%)	27(13.8%)	
Stillbirth	2(1.0%)	10(5.1%)	6(3.1%)	18(9.2%)	
RFM	13(6.6%)	27(13.8%)	10(5.1%)	50(25.5%)	
Repeat breeder	16(8.2%)	31(15.8%)	11(5.6%)	58(29.6%)	
Dystocia	3(1.5%)	19(9.7%)	5(2.6%)	27(13.8%)	
Total	**43(21.9%)**	**109(55.6%)**	**44(22.4%)**	**N (196(100%)**	

χ^2=9.935, p=0.007 and N= No. of responses, SSDF=Small scale dairy farm, MSDF= Medium scale dairy farm and LSDF= Large scale dairy farm

4. Discussion

The present study revealed that most of the respondent's housed their animals in mixed barn(44.4%), which is higher than the 33.33%, and 27.2% mixed in corral, (13.9%) separated in barn which is lower than the 49.52% and 15.23% reported by Duguma *et al.* (2015) in East Wollega respectively. This might due to shortage of land to make separate barn and corral and number of the herd size.

This study also indicated that the major sources of feed for cattle in the study area were pasture and hay (30.3%), which is lower than the 98.3% reported by Malede *et al.*, (2015) in Gondar and this agree with the 31.0% reported by Tesfaye (2007) in Metema. Crop residue (8.2%) and forage and silage (0.8%) was the least used feed resource which is smaller and higher than the finding Felleke and Geda (2001), 14% and 0.2% in Addis Ababa respectively, difference might be due to the availability of the feed resources, price of the feed and number of herd size.

The result indicates that, majority of the respondents consumed fresh milk produced at home, selling or processing different types of milk products. 34.5% of the respondents used home consumption

which is lower than the 68% and agree with the 31% reported by and Feleke and Geda, (2001) and Gatwech, (2012) respectively. This might be due to the amount of milk produced consumption and consumption preferences. There were statically significance difference (p<0.05) between herd size and selling and processing of milk and milk products.

The distribution of milk and milk products to different costumers were assessed during the studying period. About 52.9% of the respondents sold their milk and milk products to individual consumers which are lower than the 63.5% reported by Gatwech, (2012), 15.2% private processing, this higher than the 8.3% reported by Asaminew (2007) due to the price of the product, customer's preference, level of income and population size. The products of milk that are distributed to the costumers were 61.5% whole milk, 11.7% butter, 1.5% whey, which are lower than the 78% whole milk, 67% butter and 4.2% whey reported by Kedija, (2008) in Oromia region respectively. It might be on the herd size of the farm and difference among geographical distribution and level of income.

The current survey revealed that the major milk marketing challenges were, 34.4% seasonal fluctuation higher than the 16% reported by Gatwech, (2012) in Gambella and 11.7% market distance, which is lower than the 30.1%, 38% and 18.5% milk spoilage agrees with the 11.5% and 19% reported by Gatwech, (2012) in Gambella and Kedija, (2008) Oromia region respectively. It might be due to the remoteness of the area from market sites, seasons of the year and there were statically significant difference (p<0.05) between market challenges between the herd size.

Most of the respondents used 53% AI which is lower than the 66.7% and 59.6% reported by Haile *et al.*, (2013) around Hosanna and Birhan (2012) respectively and higher than the 1.75%, 32.9% and 4% reported by Adebdbay (2009), Tsegaye *et al.*, (2014) in Hawassa and Duguma *et al.*, (2014) in East Wollega respectively. This might be due to the presence of AI technology for breeding purposes. 32.5% bull was agree with Birhan (2012) in Gondar 37.8%, lower than Adebdbay (2009) 92.7%, 45% Duguma *et al.*, 2014) in East Wollega and 65% Tsegaye *et al.*, 2014 and higher than Haile *et al.*, 2013, 13.3% may be due to the presences of selected bull for breeding purposes.

Feed shortage was the most common problem for dairy production which is 84.1%, the result agree with the 82% and 84.76% reported by (Kedija, 2008) in Oromia region and Duguma *et al.*, (2014) in East Wollega respectively and higher than the 20%, 13.3% reported by Gatwech, (2012) in Gambella and Malede *et al.*, (2015) in North Gondar, respectively. There was difference in frequency of respondent's proportion on feed problems of dairy farm production. This difference may be due to number of herd size, poor pasture development, seasons of the year, unavailability of feed on the market, price of the feed, limited land available for pasture establishment, inadequate feed resources and income level of the respondents.

This study assessed the prevalence of diseases in the study area, (74.8%) which are lower than the 95.5%, 86.5% and 86.66% reported by Ketema, (2014) in Bishofitu and Duguma *et al.*, (2014) in East Wollega and Tesfaye (2007) in Metema respectively and higher than the 3.33%, 32.5% and 32% reported by Malede *et al.*, (2014) in North Gondar, Gatwech, (2012) in Gambella and Adebdbay (2009) at Bure District, Ethiopia respectively, This is may be due to inadequate animal health services, inavailablty of veterinary services and lack of veterinarians. Mastitis was cited as the most important disease in dairy production systems which is 26.0% which are higher than Birhan (2012) and Tesfaye (2007) 2.94% and 0.9% respectively. This might be due to poor hygienic of the cows, improper milking and uses of utensils. There were no stastically significant variations (P> 0.05) between the herd size and reasons occurance of animal health problems.

The present study assessed the constraints of dairy extension in dairy farms, which were inadequate extension and training services 55%, 51% no participation on research and information exchange system for dairy production. There was statically significance between herd size and research and information exchange system for dairy production (χ^2 =17.102 and p<0.05) and 62.9% inadequate education and consultation that hinders dairy farm production in the studying area, there was statically significant difference (χ^2=24.865 and p<0.05) between herd sizes and constraints in adequate education and consultation program but previous study were not revealed on the constraints of dairy extension in dairy farms due to this comparison was not done.

Attention was also given for the prevalence of reproductive problem in Gondar town and found 58.9% which is higher than the 43.5%, 40.25%, 31.76%, 43.7% and 30.8% reported by Haile *et al.*, (2013) in Hosanna, Dawit and Ahmed (2013) in Kombolcha, Gizaw *et al.*, (2011) in and around Nazareth town, Molalegne and Shiv (2011) around Bedelle and Emebet and Zeleke (2008) in Dire Dawa respectively. These variations might be due to environmental factors, breeds of animals, variation in management that is applied in different dairy farms which was different from that of Gondar. This results agree with Ebrahim (2003) in and around Kombolcha and Nibret (2014), 62% and 54% respectively and the study showed that there were statically significance variations (p<0.05) between herd size and

reproductive problems, this due to the agro-ecological difference between the studying area..

The major prevalence of reproductive problem included, 29.6% repeat breeder which is higher than the 13.8%, 2.9% and 3.78% reported by Haile *et al*., 2013 in Hosanna, Molalegne and Shiv (2011) around Bedelle and Dawit and Ahmed (2013) in Kombolcha respectively followed by 25.5% Retained placenta, which is higher than the research of Haile *et al*., 2013 in Hosanna, Molalegne and Shiv (2011) around Bedelle and Dawit and Ahmed (2013) in Kombolcha with 7.18%, 6.7% and 7.32% respectively. Variation might be due to the management, environmental factors, genetic factors, breeding problems and nutritional status.

Conclusion and Recommendations

The present study revealed that major challenges of dairy farm production, marketing and demands of milk products particularly, marketing related problems, animal health problems, inadequate animal feed resources, reproductive challenges and inadequate extension and training services, lack of research and information exchange system, unavailability of land, absence of operational breeding strategy and policy and lack of education and consultation were the major constraints for lower production and productivity in dairy farm production and vary among the herd size. Demands of milk and milk products are high and vary among the different scale of dairy farms.

Based on the above conclusion, the following recommendations were forwarded:

❖ Government should give attention on feed processing technology and adequate space for future expansion of dairy production.

❖ Marketing linkage between the producer and consumer of milk products should be created and developed.

❖ Improved and appropriate milk processing technologies and formal marketing system should be in place to improve milk processing and marketing for sustainable dairy production.

❖ Milk collection and distribution center should start processing of milk to get diversified milk products and extend its shelf-life.

❖ Awareness should be created among dairy farm owners concerning basic animal nutrition and health management for the increment of dairy products.

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