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DAIRY TECHNOLOGY ADOPTION IN SMALL HOLDER FARMER IN AND AROUND GONDAR TOWN, AMHARA REGION, ETHIOPIA

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ABSTRACT: The study was conducted in and around Gondar town Zone of Amhara regional state, North Gondar, Ethiopia to assess the dairy technology adoption practice in small holder farmer. A total of 40 Households (HHs) were randomly selected. Questioner was developed and a survey was conducted on the selected HHs pertaining dairy technology and adoption practice. The gathered data was summarized and analyzed by using SPSS 20. The result revealed that 85 % of respondents do not adopt different dairy technologies.Most of the households in the study area were usingindigenous dairy cattle breeds. The proportion of cattle's owned by respondents were 4.45±2.253, 0.7±2.366 and for indigenous, Exotic and cross breed, respectively. Despite the largest concern was given for male households, females also involved in cow management, milking activities aiming for milk consumption and income generation. Almost all farmers in the study area provided house for cattle, and about 42.5 % of the respondents indicated that loose housing system is widely used in the area. Ration formulation based on scientific standard was not common in the study area. From the interviewed households, 50 % of respondents were practicing mixing of different feed stuffs which is taken as formulation. All of the households in the study area neglects urea molasses block making and silage making technologies. In general the level of technology adoption by smallholder farmers is still unsatisfactory. Therefore, the government and extension agent should give emphasis on improving dairy technology and its adoption in small holder farmer though continuous training on how to utilize improved feeding, artificial insemination, improved housing and health care technologies.

Keywords: Adoption, Dairy Cattle, Smallholder, Technology

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INTRODUCTION

Dairy development in developing countries has played a major role in increasing milk production, improving income level in rural areas, generating employment opportunities and improving the nutritional standards of the people especially for small and marginal farmers (Uddin et al., 2010). Ethiopia has large cattle population estimated at 56.71 million heads out of which 98.66 percent of the total cattle in the country are local breeds (CSA, 2015). The remaining are hybrid and exotic breeds that accounted for about 1.19 percent and 0.14 percent, respectively (CSA, 2015). In Ethiopia, dairy production is mainly of subsistent type largely based on indigenous breeds of cattle. Currently, demand for dairy products in the country exceeds supply, which is expected to induce rapid growth in the dairy sector (Haese et al., 2007). The factor which contributed to the demand is increased urbanization and expected growth in incomes (Ahmed et al., 2004). Thought the country has one of the largest livestock populations in Africa, per capita consumption of milk (17 kg per year) is much lower than the average for Africa (26 kg per year) (Alemu et al., 2000). The dairy technologies encompass the use of crossbred animals, improved feed technology and improved management (Mohamed et al., 2004). The dairy sector in the Ethiopian highlands is characterized by subsistence oriented production, low use of technological inputs and underdeveloped markets for inputs, services and outputs (Ahmed. et al., 2004). The use of improved cross breed cows is limited and about 81% of the total annual milk production is accounted by low yielding indigenous cattle (FAOSTAT, 2014). Most development and

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research projects in dairying where conducted within and/or around Addis Ababa milk shed (Yigrem et al., 2008). In and Around Gondar town, the practical application of dairy technologies like feeding, breeding and artificial insemination and the constraints associated with its application were not investigated by researchers. Since the above factors have not been studied in the study areas; there was a need to assess dairy technology adoption by smallholder farmer. Therefore, this study were undertaken to assess the dairy technology adoption practice in small holder farmer for fill the existing information gap in the area.

MATERIAL AND METHODS

Description of the study area

The study was conducted in and around Gondar Town, the capital of North Gondar administrative zone, is located in Amhara national regional state 738 km away from Addis Ababa, the capital city of Ethiopia, in the North West direction. The town is found at latitude of 12.3-13.8°N, at a longitude of 35.3-35.7°E and at 2200m a.m.s.l. The annual mean minimum and maximum temperature of the area vary between 12.3-17.7°c and 22-30°c respectively with an annual average temperature of 19.7°c. The region receives a bimodal rainfall, the average annual precipitation being about 1000mm that comes from the long and short rainy seasons. The short rainy season occur during the months of March, April and May and while the long ones extend from June to September (CSA, 2015).

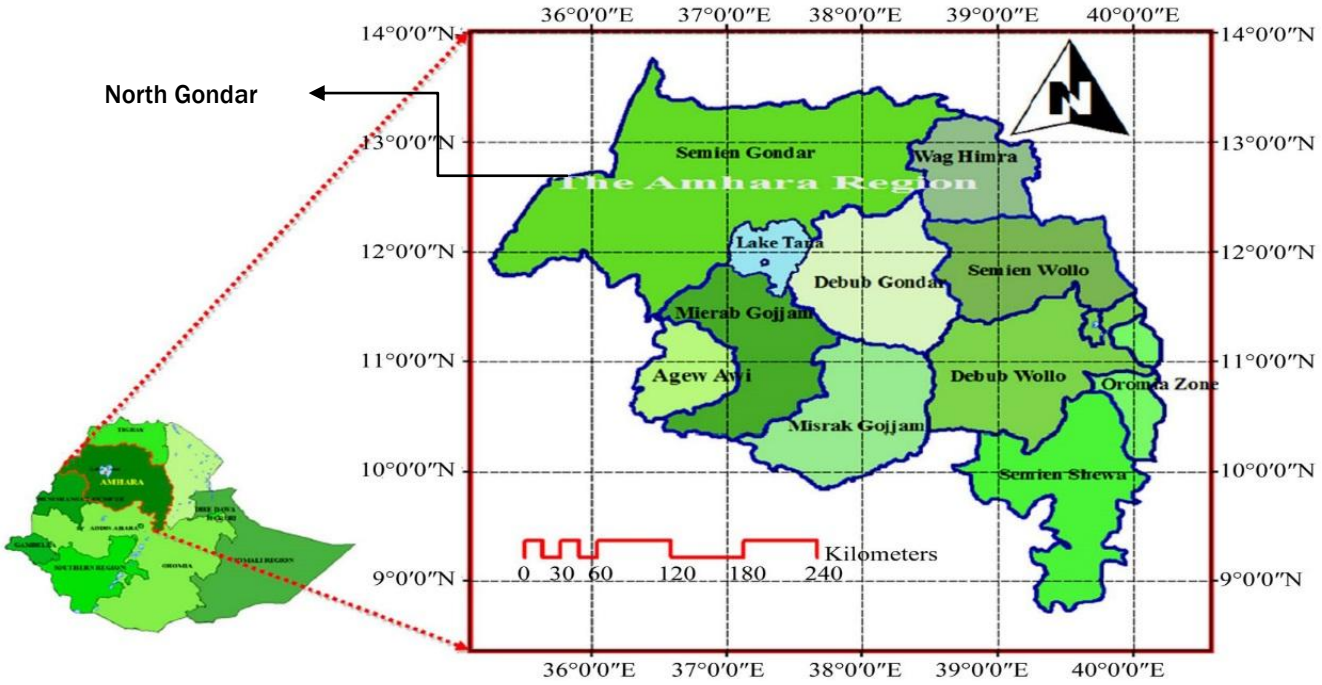

Figure 1 - Map of the study area

Study design

A cross- sectional study was conducted to address this research aim. The primary data had been collected from household survey through semi-structured questionnaires and observation. Annual reports of the Keble, books and magazine were used as a secondary data sources. Data were check for accuracy and coded.

Sampling methods and sample size

The study was conducted in Gondar district particularly with in four PAs were selected randomly from the whole peasant association (PAs). Finally ten households were selected purposively from each PAs based on the presence of dairy farmers to achieve reliable data.

Statistical analysis

The processed data were analyzed by using statistical package for social science (SPSS version 20). Descriptive statistics such as percentage, mean, were used to analyze the data quantitatively and it was presented using tables and figures. On the other hand, the data gathered through personal observation was organized according to them and analyze qualitatively to strengthen data obtain from house hold survey.

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RESULTS AND DISCUSSION

Demography, occupation and education level of the respondent

Sex, Age group, marital status, occupation, educational background and religion of the respondents in the study area are presented in Table 1. In the study area, the majority of households were male headed (75.5%) while the rest (25.5%) were females. In line with this, Tesema et al. (2009) found that about 91.11%, 8.89% were male and female who involved in dairy production respectively in his study. In contrast to this, according to the study conducted in Dejen district, female participants in dairy production were lower (35 %) (Mekonnen et al., 2006). The majority (45%) of the respondents in the study area were found to be literate (6-12), and only small proportion (17.5% of households were illiterate. The religion of 95.5% of respondents was orthodox and the reaming 2.5% were Muslim.

Purpose of keeping dairy cows

The main aim of producing dairy cows in the study area is for milk production which accounts 65% and the rest 35% of households produce cows for sale as income generation (Figure 2). In Agreement with this finding, Gebrekidan et al. (2012) indicated that the aim of dairy production in Tigray region was for milk production which accounts 50 % followed by saving as a live animal which accounts 48%, respectively.

Cattle ownership in the study area

The mean livestock holding in the study area are given in Table 2. The average number of livestock population per house 10.83 ±4.54 animals. This result is relatively higher than results reported by Chanie et al. (2015) who indicated that the average cattle number per household in Enebse Sar Mmidir district is 4.43±0.19. Among cattle groups assed in the study area, 2.10±2.352, 0.7±2.366 and 4.45±2.253 was the proportion of cross breed, exotic breed and indigenous breed, respectively. Indigenous breeds which are known with their low productive and reproductive potential are dominant than other improved dairy breeds in the study area. Typical indigenous and cross breed cows while they are in feeding situation is shown in Figure 3.

Technology adoption rate

The proportion of dairy technology adoption and reasons for resistance to technology adoption is presented in Table 3. Most small holder farmers were non adopter in technology adoption 85% and the remaining 15% adopter. A large number of dairy farmers are almost ignorant about improved technology practices and the production system by most of the household is yet traditional. In line with this, Adopters of all improved breeding, feeding, and housing systems achieve improved dairy production than do non-adopters this supported in US (Khanal et al., 2010).

Housing of dairy cows

Type of house and housing management of dairy cattle in and around Gondar Town is presented in Figure 4. About 42.5% of the respondents reported to have loose house and about 40% of tie stall, 17.5% of free stall house.

Table 1. Demographic characteristics of households in the study area

Variables	Categories	Frequency	Percent (%)
Sex	Male	29	75.5
	Female	11	25.5
Age	19-65	35	87.5
	Above 65	5	12.5
Marital status	Single	9	22.5
	Married	25	62.5
	Widowed	6	15
Occupation	Farmer	14	35.0
	Student	2	5
	Trader	16	40
	Unemployed	4	10
	Employee	4	10
Education level	Illiterate	7	17.5
	Literate(1-6)	14	32.5
	Literate(6-12)	18	45
	Literate university	1	2.5
Religion	Orthodox	39	97.5
	Muslim	1	2.5
Total		40	

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Figure 2. Purpose of keeping dairy cows

Table 2 - Cattle ownership in study area

Cattle Types	Mean	Standard deviation
Number of cross breed	2.10	2.351
Number of exotic breed	0.7	2.366
Number of indigenous breed	4.45	2.253
Number of bulls	0.82	1.01
Number of calves	2.78	0.92
Total number of cattle	10.83	4.54

Figure 3 - Typical indigenous and cross breed cows in the study area

Table 3 - Technology adoption by households

Variables		Frequency	Percent (%)
Technology adoption	Adopters	6	15
	Non adopters	34	85
Reason for resistance to TA	Lack of awareness	6	17.6
	Lack of extension agent	14	41.17
	Lack of resource	4	11.76
	All	10	29.41

TA = Technology adoption

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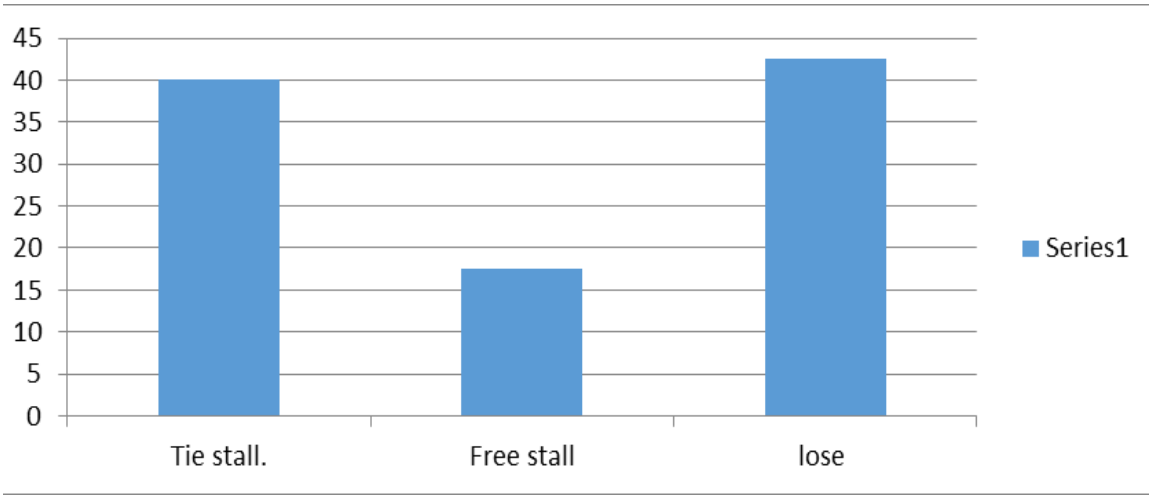

Figure 4 - Types of housing

Breeding practice of dairy cows

The application of artificial insemination technology for improving the reproductive and productive performance of cows in the study area is still low the level of technology adoption by smallholder farmers is still unsatisfactory. Most of the smallholder farmer 57% uses natural mating, 20%use artificial insemination and the remaining 22.5% used both natural mating and artificial insemination. Similarly, application of important dairy technologies like AI, Improved forage development and vaccination of animals was found to be low in the previous studies conducted in Kenya and Ethiopia (Kebebe et al., 2016). Provision of veterinary service and artificial insemination technologies in Ethiopia is very limited and the system is very poor (Ayele et al., 2012; Tegegne et al., 2010).

Feeds and feeding system of dairy cows

The result of feeding system in the study area is indicated in Table 5. Among interviewed households, 17.5% of the respondents have experience on growing improved forage around their home while adoption of different varieties of forage is not practiced by the majority (82.5 %) of the households in the study area. Mixing of different feedstuffs which is considered as ration by households was practiced by 50% of respondents. But the ration might not be in line with scientific standard as it misses nutrient values of feeds and the requirement of the animals, it is done by estimation. Physical treatment of feeds like cooping was found to be the most (92.5%) common practices by households in the study area but treating feeds by chemicals like urea was not totally adopted by farmers. The urea molasses block making as a mineral supplement for improving the performance of animal was totally ignored by households in the study area. Silage making as a mechanism for feed conservation was not also adopted by all farmers in the study area. Free grazing with supplementation of some feeds at night and morning was found to be common in the study area.

Major constraints of dairy technology adoption

The major constraints of dairy technology adoption on housing, feeding and breeding are presented on Figure 5. The major constraint of adopting scientific knowledge regarding housing was lack of land (35%), lack of knowledge (30%) and lack of suitable well drained site. In line with this result lack of land for dairy production activities was mentioned as a major constraint of dairy production in Jimma town of oromia region (Belay, 2011). On the other hand, the major problem of adopting breeding technologies were lack of extension service and knowledge to detect heat and to inseminate animals (37.5%), and inability to support the fetus (40%) were the two major constraints. The major problems concerning on feeds and feeding technologies were shortage of land for growing forages (32.5%), lack of feed access from government (30%), high price of concentrated feed to formulate balanced ration (20%) were the three major constraints. In line with this, Asaminew and Eyasu (2009) reported that the major problem in feeds and feeding of dairy cow in Bahirdar Zuria and Mecha district is lack of feeds which accounts 38.9 % from the respondents. According to our findings, there are so many factors that affect dairy technology adoption. The major problem in all aspects of dairy technology adoption lies on lack of awareness (Knowledge) which is the result of poor extension service by experts. In line with this finding, Chagunda et al. (2006) reported that lack of knowledge was one of the main reasons for not adopting performance recording in smallholder farms in Malawi.

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Table 4 - Forage development, feeding system and feed treatment practice			
Indicators		**Frequency**	**Percent (%)**
Experience on Growing of improved forage		7	17.5
Give formulated ration for dairy cows and calving cows		20	50
Ration formulation basis	Based on body weight	3	7.5
	Based on breed	3	7.5
	Based on age	2	5
	Randomly	12	30
Feed treatment	Physical treatment	37	92.5
	Chemical treatment	37	92.5

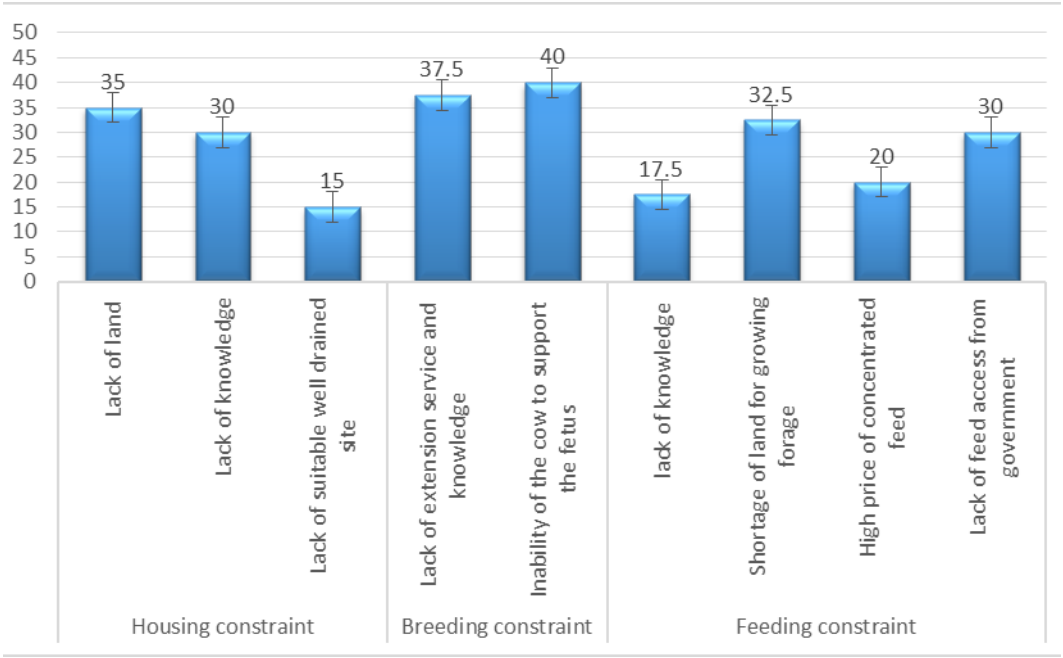

Figure 5 - Major constraints of dairy technology adoption.

CONCUSION AND RECOMMENDATION

It could be concluded that the level of technology adoption related with feeding technologies, Breeding technologies, better housing, health care activities by smallholder farmers is still unsatisfactory. Especially implementation of urea molasses block technology as a supplement to improve milk productive performance of cows is neglected by farmers in the area. Besides, the practice of improved forage development strategies and treatment of feed is also very low in the area. The main reasons for resistance according to the respondents were lack of knowledge, extension service, and limited resource. Among the technologies observed in the area keeping of cows independently in Tie stall housing system was found to be better compared to other technologies. Among the constraints in the study area, Lack of knowledge was found to be the common hindering factor for adoption of dairy technologies related with housing, feeding and breeding. The knowledge gap on advantages of technologies could be a major problem for the loss of interest by small holder farmers for accepting new technologies related with dairy improvement in the study area. Introducing different dairy technologies should be supported with a continuous training or technical backup on how to manage and utilize the technology as well. Dairy technology input and/or service providers should undertake follow ups to identify possible problems and/or evaluate the use and benefits of the interventions.

DECLARATIONS

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Author's contribution

All authors contributed equally to this work.

Competing interest

The authors declare that they have no competing interests.

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