Assessment of Dairy Production and Management Practice under Small Holder Farmer in Adigrat Town

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Abstract
The study was conducted in Adigrat town and aimed at assessing the dairy cattle production, management practices and constraints associated to milk production under smallholder. The data was collected by questionnaire from three purposively selected Kebeles (02, 04, and 05) and 30 respondents that are 10 selected householders from each Kebeles. The major feed resources in the study area were hay, crop residues and by-products of the local beverages Atella (lees) and industrial by products such as wheat bran and noug seed cake. The major constraints to milk production in the study area were feed shortage, disease prevalence and low milk yield. Disease is one of the major problems associated with dairy production or milk production system that causes mortality and reduced milk production. Also, in the study area the following management practices are assessed feeds and feeding, breeding using Artificial insemination (56.67%) and natural services (43.33%), housing system, healthcare and other manure handling. In addition, in the area hand milking is the sole milking method practiced in all the study area. Frequency of milking across the dairy production systems of the area was twice daily.
Keywords: dairy cattle, management, indigenous, production, smallholder

1.   Introduction
1.1. Background of the Study
In Africa, livestock represents a major national resource and form an integral part of the agricultural production system. Export of live animals and animal product make substantial contribution to the foreign exchange earnings of many countries (Mukassa *et al*., 1991). In many aspects the dairy industries occupy a special position among others sectors of agriculture milk are produced every day and gives income to the numerous small producers. Milk production is highly labour intensive and makes an enormous variety of high quality product. The high cost of milk as a row has necessitated tech- processing industry. The special nature of milk (perishable and bulky) leads to the necessity of the strict and comprehensive quality regulation and to a high transport costs. The large dependency of milk producers on the dairy industry has resulted in a strong position held by cooperative in milk marketing processing (Falvey and Chanldynalz, 1999). With cattle population endowment Ethiopia stands first in Africa and among the top ten in the world (Hailemariam, 1994). Cows represent the largest proportion of cattle population of the country. According to FAO (1990) 42% of the total cattle heads for the private holdings are milking cows. However, production efficiency of cows is low in Ethiopia despite their large population. Although Ethiopia is sufficient enough in meat production still imports dairy products. Milk produced from animals provides an important dietary source for the majority of rural as well as considerable number of urban and pre-urban population. The consumption of milk and milk products vary geographically between the high land and level of urbanization. In the lowland all segments of the population consumes dairy products, while in the high land major consumers include primarily children and some vulnerable groups of women (Mohamed *et al*., 2004). The demand to milk depends on many factors including consumer preference and income, population size, and price of milk and milk substituted (Mohamed *et al*., 2004). In addition to fresh and fermented milk, other traditional milk products wiedly in Ethiopia consume in different parts of the country including butter, ayib (Ethiopia traditional cottage cheese) and ghee (clarified butter) (Almaz *et al*., 2001). The major function of animal production including dairy animals is to provide protein, energy, mineral and vitamin to supplement the cereal grain and plus in the human diet. Animal products also contribute more to human diet.
 Ruminant animals can obtain much of their energy and protein from feeds not directly convertible in to food suitable for human consumption, such as food and by product grains not meeting standards for human consumption, forage, pasture, urea and other non-protein nitrogen source (Mattewan, 1993). In most countries specially the food deficient countries including Africa, large area of land not suitable for food crop production can be used for growing forages that may be harvested directly by the animals for examples about 25% of the total land area in developing countries is used for permanent (FAO, 1990). Urban and pre-urban dairy production systems are among the many forms of dairy production system in the tropics. The system involves the production, processing and marketing of milk and milk products that are channelled to consumers in urban centers. Market oriented urban and pre-urban dairy production systems are emerging as important components of the milk production system in Ethiopia. These systems are contributing immensely towards filling the widening demand and supply gap of milk and dairy products in urban centres, where consumption of milk and milk

products is remarkably high (Azage *et al.*, 2000).

1.2. Statement of the Problem

More livestock population are found in the study area. Dairy farming has been practiced by the smallholder farmers for long period. The resource poor farmers get food (i.e milk) and income from the dairy cattle farming. Inspire its great importance; the dairy sector is not contributing to the required level due to various problems among which limitations of an accurate, reliable and organized data in dairy cattle production and management. For these reason it has been remained to be difficulty to now the right way of the expressing of programmes in the study area.

1.3. Significance of the study

The assessing of this study enables to collect base line information on small holder dairy cattle production and management in the study area. The collected information /data base is help full for formulating appropriate dairy intervention practices. The study also enables to identify the major factors that affect the dairy cattle producers of the small holder farmers. In addition to this, the study can benefit the small holder farmer/farmers of the dairy producer's potential investors, governmental and non-governmental organizations and policy maker that are interested to participate actively in milk production and marketing practice.

Objectives of the Study
General objective
    ✓ To assess the dairy production and management practice under small holder farmer in Adigrat town
Specific objectives
    ✓ To assess the production performance of small holder dairy cows in the area
    ✓ To assess the management practices of the small holder dairy cattle in the area
    ✓ To identify the major constraints for small holder dairy cattle production of the area

2. Methodology

2.1. Description of the Study Area

The District is located between 14^0 10˙N and 40^0 10˙ East longitude and at elevation of 2457 meters above sea level (m.a.s.l.). In addition at about 115 km far away from city of Tigray, Mekelle north and 902 km far away from capital city of Ethiopia, Addis Ababa to the North. The district share boundaries with Hawzien in the south, Enticho in the west, Gulomahda in the north, and Saesi Tsaedaemba in the East parts. The livestock population of the district includes 51,514 cattle, 90,090 sheep and goats, and 67,769 poultry (chickens) respectively (Tyhra *et al.,* 2011).

2.2. The Climatic Condition of the Area

The Climatic condition of Adigrat town is often characterized by its being suitable and pleasant for living where: - the average annual rain fall is often in the ranges of 500-650mm.Temprature of Adigrat town is moderate which is between 15^0c and 20^0c that makes the area comfortable for human settlement. In general the agro-climatic condition of Adigrat town is recognized for its being comfortable for living not only by its residents but also by guests. This is one of important natural gift that loves the background for conductive working condition. The climate of the town is 7% of Dega, 80% of semi-Dega, and the rest is Qolla. Most of the eastern zone speaks Tigrigna as their first language except ethnic group of Irob people (Ibid).

2.3. Population Size of the Area

Based on the 2007 natural census conducted by Central Statistical Agency of Ethiopia (CSA) this town has a total population of 72,781 with that of 32,871 males and 39,910 females the majority of the inhabitants said they practiced Ethiopian orthodox Christianity with 94.91% reporting that as their religion, while 3.02% of the population were Catholics and 2.68% were Muslim (Adigrat plan and finance office, 2012/13).

2.4. Sample Technique and Size

The sample technique was purposive sample technique. In addition, the study area was consists six Kebeles and among these Kebeles three Kebeles were purposively selected due to their potential of dairy cattle compare to other Kebeles. At last, the sample size was 30 respondents that is 10 respondents from each three (02, 04 and 05) Kebeles.

2.5. Data Collection Methods

Both primary and secondary data was used in conducting this study. The primary data was collected by observation; interview and questionnaires of the sampled respondents of the owners of the smallholder dairy farmers' whereas the secondary data was collected from the written documents of office of agriculture and rural

development of the Adigrat town about the small holder dairy farmers in terms of feed sources and health care.

2.6. Data Analysis
The data was analysed and organized using descriptive method accordingly; statistical tools like percentage, ratio were used in data analysis.

3. Result and Discussions
3.1. Households General Information
The household of the study area were almost headed by both males and females. Both of them in the study area had a great responsibility to lead the family than other parts of the country. As the data obtained from respondents, though 54.84% (the majority) females and 45.16% males are involved in household both of them have equal responsibility. The age of the respondents is almost in the medium age level 31-40 years. The study area education status of the respondents were 16.67% illiterate, 30% primary, 23.33% secondary, 10% degree and the remaining 6.67% are others. Each respondent have a minimum of 3 and maximum of 5 dairy cows.

Table 1. General information about respondents

S no	Variables	Specific characteristics	Respondents	
			No	%
1	Sex	Male	16	53.33
		Female	14	46.67
2	Age	20-30 years	6	20
		31-40 years	9	30
		41-50 years	8	26.67
		51-60years	5	16.67
		Above 61 years	2	6.67
3	Education level	Illiterate	5	16.67
		Primary	9	30
		Secondary	7	23.33
		Diploma	4	13.33
		Degree	3	10
		Others	2	6.67

3.2. Management of Dairy Cows
3.2.1. Dairy cattle feeds and feeding management
The major sources of feed for cattle in the study area were hay, grass, crop residues mostly barley straw and non-conventional feedstuffs (local brewery by-products, Atella) and industrial by product (wheat bran and NSC). This result is in line with the findings of (Asaminew and Eyassu, 2009) who reported that natural pasture, hay, crop residues and non-conventional feedstuffs (local brewery by-products) are major feeds in Bahir Dar Zuria and Mecha woredas of the Amhara Regional State.

Table 2. Major available cattle feeds in different months of the year

No	Months	Feed type	Respondents	
			No	%
1	Sep – Nov	Hay, grass, straw and cactus	7	23.33
2	Dec –Feb	Hay, grass, straw, Injera & wheat bran	9	30
3	Mar – May	Hay, straw, grass, Atella(lees) & wheat bran	6	20
4	Jun - Aug	Hay, grass, straw, noug seed cake	8	26.67

Sep: September, Nov: November, Dec: December, Feb: February, Mar: March, Jun: June, Aug: August

In the study area indicated that hay, straws and grass are used throughout the year as the main feeds and wheat bran, household wastes (Injera and Atella), NSC are used as supplementary feeds. The current study is similar to (Sintayehu et al., 2008) report in Shashemene to Dilla areas; Adigrat town dairy farmers have no access to grazing land. But in particular feed resources availability has been varying and categorized into wet season and dry season feeds.

Feed shortage occurs both in dry and wet season; however, the shortage was severe during the dry season. Keepers overcome the situation by storing feeds in the form of hay and providing local brewery waste (Atella) by purchasing from Tella sellers which is similar to report of (Asaminew and Eyassu, 2009).

3.2.2.   Water sources for dairy cows

Table 3. Water sources for the dairy cattle in the study area.

Water source	Kebeles			Respondents	
	02	04	05	No	%
Tape water	6	5	10	21	70
Spring water	4	5	-	9	30
Both tape & spring water	10	10	10	30	100
River water	-	-	-	0	0

In the study area water sources for dairy cattle are tape and spring water. But there is no river in the town or around the town. Almost all Kebeles use tape water for their dairy cattle and this is due to much more availability over the other water sources. Watering frequency of dairy cattle depends on access to water sources, the age structure of the herd, physiological stage of animals, amount of dry mater intake and season. The water resources used by dairy farmers in the town varied depending on the agro-ecology and production systems. Scarcity of water is severe during the dry season since spring water and wells are not available as reported by household respondents of the smallholder dairy farmers of the study area.

3.2.3.   Housing of dairy cows

Respondents reported that housing is important to protect them from excessive wind, sunshine, predators, airborne diseases and other hazardous effects of the environment. Dairy animals are often housed at all times except if exercising is needed. The type of housing is not constructed depending upon the classes of dairy animals, physiological and stage of dairy animals. The floor and wall were made of clay, stone, mud and wood materials. The barn is not subdivided for each group of animals (milking, dry, pregnant, heifers and calves). All this animals live together in the same barn. Therefore, the animal's house construction and housing system is too difficult for management aspects.

As it was assessed, all the respondents in the town use intensive housing system because of lack of excessive space and scavenging feed. In addition to this the type of house constructed in the area is stain chained (open front house) because of the moderate environmental whether condition and the arrangement system of the dairy cows in the house is one directional. The building has poor quality and no good ventilation, no strong wind proof. It's inside floor been very dumpy and contains animal waste products.

3.2.4.   Breeding system of the dairy cows

As it is assessed in the area and the farmers responded that the reproductive performance of their dairy cows is vary due to breed and managemental handling methods. Also reproductive performance is influenced by both genetic and non-genetic factors. In dairy animals, reproductive performance affects total milk production and calf crops obtained in the life time of dairy cows. Respondents revealed that the age at first calving (AFC) of indigenous heifers is 3.5 years which is in line with tropical cows reported by (Mukassa, 19 89).

Table 4. The common breeding methods in the study area

Breeding Method	Kebeles			Respondents	
	02	04	05	No	%
Natural service	3	6	4	13	43.33
AI	7	4	6	17	56.67

AI: Artificial insemination

As indicated in the above table 4, 56.67% of the respondents (n = 17) uses AI and the remaining. 43.33% of the respondents (n = 13) uses natural mating. As they have responded that AI may be preferred to insemination by a bull, because the rate of genetic progress can be increased, there is no cost or no danger associated with keeping a bull on the farm and the conception rate may be increased. The technique involves care and rearing of males from birth to maturity; collecting, grading, preserving and transporting of the semen to females. Development and spread of AI programs has many advantages. The most important one is the use of good sire to produce many daughters in different agro-climatic zone to improve the future generation. With the advent of frozen semen, it is now possible to transport semen too far off places and also use the semen even if the bull is dead. The AI also helps in prevention of spread of reproductive disease through use of disease free bulls. Artificial insemination is not commonly used in many tropical milk production systems: normal (natural) service using a bull is practiced. If normal service is used and the bull runs with cows, there will be no need for the farmer or stockman to worry about estrus detection.

When AI is used, the precise of time of estrus must be detected for the insemination to be carried out at the right time. Providing the necessary resources for artificial insemination is relatively more costly in developing countries, especially if the transport and semen storage costs are high. A second disadvantage of artificial insemination is the potential loss of genetic diversity caused by farmers using a small number of high-value bulls. Out of the 30 respondents of the farmers almost all of them bred their cows with Artificial insemination breeding technique. As it is assessed, the owner of the cows involved in the estrus detection of their cows for the

insemination purpose when they show some of the estrus sings; discharges around vagina, mounting on other animals, bleating, urination and others.

3.2.5. Manure handling

Manure management varies according to dairy production systems. Manure is used as a source of fuel dairy system. Manure is also used to fertilize crop lands. The experience from different production systems shows that manure is an important input for crop production and for nutrient recycling, but its importance is limited and challenges dairy farming in urban settings. Besides, manure is an alternative source of energy (in the form of biogas), although this was not observed in the study areas.

3.2.6. Milking procedure and frequency

Table 5 shows that cows' average milked per day and milking frequency as well as milking methods. In the study area hand milking is the sole milking method practiced and calves are allowed to suckle their dams before and after milking in line with (Asaminew and Eyassu, 2009). Frequency of milking in the study area is two times in a day.

Table 5. Average milk production liter/day per cows and milking methods

Kebeles	Milk production average (L/ day)		MM	Respondents	
	Morning average	Evening average	Hand	No	%
02	8	6	Hand	10	33.33
04	7	6	Hand	10	33.33
05	8	7	Hand	10	33.33
Average	7.67	6.33			
Total x̄	(Morning +evening average)/2 = 7				

X̄: Average; MM: Milking method

Hygienic milk production is important and should take into account the sanitation of the barn, personnel involved in milking and the utensils used to collect and store milk. Cleaning of the teats before milking contributes to hygienic milk production. Due to this almost all number of farmers sanitizes teats of their dairy production system with the assumption that teats are cleaned when the calf suckles before milking. In fact calves are also allowed to suckle after milking to ensure complete milking. Sanitation of the milking and milk storage utensils varied between individuals of the farmers in the study area. The method is believed to improve the flavor, taste and quality of milk and milk products, and extends the shelf life of dairy products.

Milk yield performance of cows as reported by farmers varies across the different dairy production systems in the study area, mainly due to differences in breed and management practices. The average daily milk yield (ADMY) of indigenous dairy cattle is 3–5 Lit/day if the management practice is good enough for them. Daily milk yield of crossbred dairy cows in the study area is ranged 10–16 Lit/day. This is attributed to differences in exotic gene level of the crossbred animals and management. As it is assessed from the owners of the small holder dairy farmers of the study area, they follow all hygienic practices before milking (like hand washing, udder washing, utensils cleaning and others), during milking and after milking.

3.2.7. Health care

As it is responded by the respondents of the area disease is one of the major problems associated with dairy production or milk productions system. Disease can causes mortality of both the calves and cows and reduced milk production. Diseases of lactating animals such as, mastitis, ketosis, hypocalcaemia, milk fever, are serious economic problems for dairy farmers. The huge percentage of mastitis in dairy herd causes losses by lowering milk production, calve death and even the dairy cows. From infected cows loss of infected milk must be thrown a way which is also another cause of the loss from the dairy sector. Possible loss of permit to small infection becomes serious enough.

Ketosis is also a nutritional disorder in dairy cow and results in drop milk production and order of acetone in breath urine and milk; it usually affects cows with one to 10 days after covering and results in drop in milk production and loss of appetites. In addition to disease parasites are the other causes of the loss in the dairy sector. The common parasites that occur on the dairy cows are thick, mites and lice that appear at the end of wet season and beginning of the dry seasons. As owners have responded that their dairy cows are sprayed at least twice a year.

4. Conclusion and Recommendations

4.1. Conclusion

Dairy production was found to be an important enterprise and have the potential to be economically viable and greatly contribute to poverty alleviation, food security, improved family nutrition, and income and employment generation. However, shortage as well as high cost of feed, occurrence of disease, expensive veterinary services, lack of timely AI, financial and marketing problems were the main constraints limiting dairy production in the study area.

Housing is the most important management component for suitability of dairy cattle that described on the

study area by the respondents. The result of this study indicated that smallholder dairy cattle in the study area were experiencing in traditional management practices and accomplish with some constraints.

The production of dairy cows in the study area is mainly based on intensive management system, which is based on feeding of hay and straw, crop residue, supplement feeds, with no grazing area. In the study area constraints like feed, shelter, injury, veterinary and climate were encountered but the major constraint is disease with, due to low preventing condition.

4.2. Recommendation

To overcome some of the issues, the following are set of recommendations that could help in tackling some of the problems and may lead to the development of animal management and production activities

Dairy animal husbandry such as feeding, cleaning and management are mainly the responsibility of women in almost all of the respondents but there should be equal understanding about the dairy production and its advantage.

Dairy farming has several opportunities for dairy producers and economic development of the country at large. To realize this dairy development there should be policy support.

Animal house should be designed to protect from rain, dumpy and it depends on the number of the animals reared. The inside part of the house has to be subdivided and ventilated and the pregnant and non-pregnant animals should be separated and also farmers should follow the day to day animals hygiene.

Cattle breed improvement strategy should be focused on the genetic improvement technology.

The Government and NGO's should give attention for dairy development.

The formation of a systematic performance recording system is necessary and the allocation of information and advice to smallholder farmers and extension services is fundamental for the success of the crossbreeding systems. Extension message should be directed towards preventing injury, disease, and feeding, housing and veterinary services.

5.   References

Abdulai A and Huffman W (2005), The Diffusion of New Agricultural Technologies: The Case of Crossbred-Cow Technology in Tanzania. American Journal of Agricultural Economics 87 (3), pp 645-659.

Almaz Gonfa, Howard Foster and Wilhelm Holzaptel (2001), Field survey and literature review on traditional fermented milk products of Ethiopia international journal of food micro biology. 66(2001), pp 173-186.

Asaminew Tassew and Eyassu Seifu (2009), Smallholder Dairy Production System and Emergence of Dairy Cooperatives in Bahir Dar Zuria and Mecha Woredas, Northwestern Ethiopia.

AzageTegegne, Million Tadesse, Alemu Yami and Yoseph Mekasha (2000), Market oriented urban and per-urban dairy production systems.Addis Ababa Ethiopia.

Byerly (1996), The role of livestock production in developing countries.

Cunningham P (1989), The genetic improvement of cattle in developing countries. Theriogenology 31, pp 17-28.

Falvey and Chalayhena (1999), Management of reproduction in small holder dairying in the tropics ILIRI Nairobi Kenya.

FAO (food and Agriculture organization of the United Nations) (2005), Milk and dairy products, post-harvest losses' and food safety in sub –Saharan African countries.

Getachew Feleke and Asfaw Tolesa (2004), Assessment of the type, level and value of post-harvest milk losses in Ethiopia. National dairy sub sector assessment report in ministry of Agriculture and Rural development (MOARD) and Agriculture organization of the United Nations, Addis Ababa.

Henderson (1984), Application of genetic models in animal breeding.

James (1992), Review of current and future consumption trend of milk and dairy production.

Mukasa E, Teggegne A, Mesfine T Teklu Y (1991), Reproductive efficiency of bos indicus (zebu) cows under AI management in Ethiopia animal Reproduction science.24: pp 63-72.

Mukasa-Mugerwa E (1989), A review of reproductive performance of *Bos indicus* cattle. ILCA Monograph No. 6, International Livestock Center for Africa (ILCA), Addis Ababa, Ethiopia.

Sintayehu Yigrem, Fekadu Beyene, Azage Tegegne and Berhanu Gebremedhin (2008), Dairy production, processing and marketing systems of Shashemene–Dilla area, South Ethiopia

Xendery B (1998) Coalescence of molecular and quantitative genetics for livestock improvement, journal of dairy science, 73, pp 2619-2627.

Yoseph H (1999), Improvement of feed resources on production and reproduction performance of dairy cows in the urban and pre-urban milk shed and evaluation of non-conventional feed resource using sheer.Msc, thesis, Alemaya university, Ethiopia.