

Assessment on the Availability of Potential Feed Resources in Commercial Dairy Farms in Selected Districts of Tigray Region, Ethiopia

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Abstract: This study was attempted to investigate the potentially available feed resources and challenges in the commercial dairy farms found in Mekelle, Wukro and Adigrat. A total of 60 dairy farms were selected randomly from the study areas and were divided into three scales. A semi-structured questionnaire was prepared and the farm owners, workers, managers and professional employees were interviewed and the farms were also visited. The major feed composition types used by the different dairy farms visited during the study period were hay, straw and concentrate (41.67%); hay, straw, concentrate and alfafa (20%); straw and concentrate (18.33%); hay, straw, concentrate, alfalfa and atella (10%); hay, straw and 'atella' (8.33%); and hay and straw (1.67%). The educational status of the farm owners and workers was correlated with the type of feed formulation that they followed in each farm as well as the type of feed to be given. The major constraints described by the various dairy farms in terms of feed resources were feed availability problems (36.67%), price inflation problems (23.33%) and both feed availability and price inflation problems (40%). The majority of illiterate farm workers/owners (74.43%) didn't use feed formulation in their dairy farms but the degree of usage of feed formulation by the educated ones was in accordance with their educational level. Therefore, to fill the gaps seen in the current study an intensive promotion of extension work should be done to create awareness among the farm owners and workers about good feeding management practice, feed formulation and cultivation and treatment of forages and crop residues so as to minimize the scarcity of feed in dairy farms.

Key words: Awareness • Constraints • Dairy Farms • Education • Feed Availability

INTRODUCTION

Livestock farming is vital for the supply of meat and milk and in addition it also has a significant contribution to the Ethiopian economy by serving as source of income for both small holder farmers and livestock owners. But production per animal is extremely low [1, 2]. Ethiopia is known for its huge cattle population and has about 27 breeds of cattle and the average milk production/lactation of the indigenous cow ranges from 494-850 Kg under optimum management [3- 5]. The total cattle population for the country is estimated to be about 53.99 million. Out of this total cattle population, the female cattle constitute about 55.48% [6]. Dairy industry in the country is not well developed as in other east African countries such as Kenya, Uganda and Tanzania [2]. In 2009, the average

cow milk production was estimated at only 1.54 litres/cow per day [7] and the per capita milk consumption was only about 16 Kg/year, which is much lower than African and world per capita averages of 27 Kg/year and 100 kg/year, respectively [8]. A little improvement is noted in recent reports where the total production of cow milk has increased to 4.06 billion litres (average daily milk production/cow is about 1.86 litres) [9] and per capita consumption of milk increased to 19.2 kg [10]. However, the dairy industry in the country is still lagging far behind the demand due to the fact that the ever increasing human population, urbanization trends and raising household incomes [11, 12].

Productive and reproductive performance of cattle is influenced by feed, genetics, disease and management practices [13, 14]. The availability of feed resources and

the nutritional quality of the available feeds are the most important factors that determine the productivity of livestock. Livestock production throughout the world is dependent on a variety of feed resources. Worldwide, there are more than 560 different types of feed resources derived from herbaceous forages, trees and shrubs, food crop residues, food crop green feeds, food crop roots and tubers, concentrates and agro-industrial by-products, mineral supplements and others [15]. The livestock production in Tigray, as in many parts of Ethiopia, is traditional and generally dependent on crop residues, natural grazing/browsing, hay from natural pastures, agro-industrial by-products and introduced forage crops [16]. The availability of crop residues is closely related to the farming system, the type of crops produced and intensity of cultivation. In the whole Tigray region, there is an estimated 878,322 ha arable land available for the production of cereals, pulses (grain legumes) and oil seeds [12] and contribute about 45% of the feed demand [17]. However, according to a recent estimate the contribution of crop residues to livestock feed is only 4% [18]. On the basis of an average of 1.4 tones dry matter per hectare crop residue yield assumption [19].

Currently, the government has given due emphasis to the livestock production to maximize its contribution to the national Gross Domestic Product (GDP). For this reason the dairy industry is one of the emerging and fastest growing livestock production systems in urban and peri-urban areas of the country at large and Tigray region in particular. A large number of commercial dairy farms keep both exotic and cross breeds of cattle in the region. However, information on the type of available feed resources and its challenges are limited. Therefore the aim of the present study was to assess the potentially available major feed resources and challenges in the commercial dairy farms found in Mekelle, Wukro and Adigrat.

MATERIALS AND METHODS

Study Area: The current study was performed in the selected areas of Tigray region viz. peri-urban and urban areas of Mekelle, Wukro and Adigrat.

Tigray is located at the northern limit of the central highlands of Ethiopia. The landform is complex composed of highlands (with an altitude range of 2300-3200 meters above sea level, (masl), lowland plains (with an altitude range of <500-1500 masl), mountain peaks (as high as 3935 masl) and high to moderate relief hills (1600-2200 masl).

Thus Tigray has diversified ago-ecological zones and niches each with distinct soil, geology, vegetation cover and other natural resources. The climate is generally sub-tropical with an extended dry period of nine to ten months and a maximum effective rainy season of 50 to 60 days. The rainfall pattern is predominantly uni-modal (June to early September). Exceptions to the rainfall pattern are areas in the southern zone and the highlands of the eastern zone, where there is a little shower during the months of March to mid May. Considering rainfall, atmospheric temperature and evapotranspiration, more than 90 percent of the region is categorized as semi-arid. The remaining areas in the region can be categorized as dry sub-moist (near the central south highlands and the Wolkite highlands) and arid (the lower areas of Erob and Hintalo Wajerat woredas). There are also some moist zone patches in the Kisad Gudo, Mugulat and the Tsegedie highlands [20]. The region is divided into five zones- West Tigray, Northwest Tigray, Central Tigray, Eastern Tigray and Southern Tigray- and 35 Weredas (Figure 1).

Study Design: A cross sectional study was conducted from November, 2013 to April, 2014 in selected peri-urban and urban areas of Tigray region in 60 dairy farms, which had both exotic and cross breeds. Dairy farms having more than 3 cattle were considered in the present study and the selection of the farms was conducted using simple random sampling technique.

Questionnaire Based Survey: A semi-structured questionnaire was prepared, pretested and administered. The farm owners, managers or representative individuals of the farm were included in the questionnaire survey to assess and explore the feeding management practices, feed source availability and type and composition feed used in the farms. In addition, the challenges of each farm in relation to feed availability were investigated. Field observation was also conducted during the questionnaire administration time to look the status of the farms.

Data Management and Analysis: The data collected from the study areas were coded and stored in Microsoft Excel 2007 spread sheet and transferred to STATA Version 15 for statistical analysis. Descriptive and Chi-square test (χ^2) were applied to test if statistically significant association exists between the scales of the farms; feed availability and prices, educational back ground, types of feed items and feed formulation used by the farms.

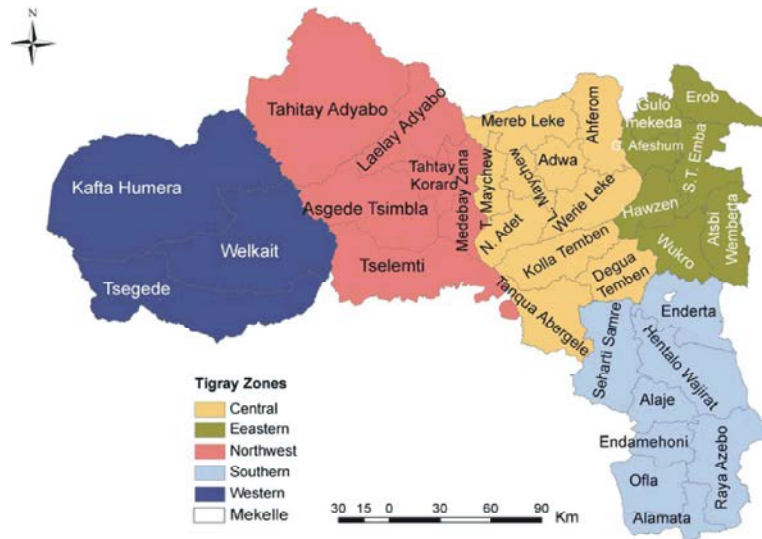


Fig. 1: Map of Tigray National regional State and Study areas

RESULTS

The hay, straw and concentrate feed (HSC) composition type was the most commonly used one by both small scale (40%) and medium scale (42.11%) dairy farms. In the large scale dairy farms hay, straw and concentrate and hay, straw, concentrate and alfalfa compositions (HSCAl) were the most commonly and equally used ones (42.86%). But among the whole feed compositions, the HSC feed composition type was the most commonly used by the different scale dairy farms (41.67) (Table 1).

The major constraints in relation to feed in the small scale dairy farms were both feed availability and price inflation problems (60%). However, in both medium and large scale dairy farms the main constraint mentioned was feed availability problem, which was 42.11% and 71.43%, respectively. In general, feed availability and price inflation problems (40%) were observed as being the most dominant challenge among the different scale dairy farms (Table 2).

Results indicated in Table 3 showed that as educational status of the dairy farm workers had a direct influence in the usage of feed formulation in their dairy farms. The majority of illiterate farm workers (74.43%) didn't use feed formulation in their dairy farms but the degree of usage of feed formulation by the educated ones was in accordance with their educational level (Table 3).

DISCUSSION

According to the current research findings, hay, straw and concentrate feed composition type was the

most commonly used one by both small scale (40%) and medium scale (42.11%) dairy farms. In the large scale dairy farms hay, straw and concentrate and hay, straw, concentrate and alfalfa compositions were the most commonly and equally used ones (42.86%). In general, the hay, straw and concentrate feed composition type was the most commonly used feed composition by the different scale dairy farms (41.67%). This finding is almost in agreement with the findings of [21] in Dandi District, Oromia Regional State, Central Ethiopia, who reported as the major sources of feed for livestock in the study area are natural pasture grazing, crop residue, conserved hay, stubble grazing, nonconventional feeds and oil seed byproducts. In addition, [22] reported as the major feed resources in the highlands of Ethiopia are natural pasture, crop residues and stubble grazing. Moreover a study by [23] in the Highlands and Central Rift Valley of Ethiopia, reported purchased hay, concentrates and crop residues as the major feed resources in the highland production system and natural pasture and crop residues in the Central Rift Valley production systems.

The major constraints for the feed resources at the different dairy farms were both feed availability and price inflation problems (60%) in the small scale dairy farms, but for both medium and large scale dairy farms the main constraint was feed availability problem, which was 42.11% and 71.43%, respectively. But the feed availability and price inflation problem (40%) was the most dominant one among the different scale commercial dairy farms. This is in agreement with the findings of [24] in Bekoji town, who reported as the price of the concentrate feeds increases from year to year and feed scarcity both in terms of quantity and quality. In addition studies performed by

Table 1: Types of feed items used by the different scale commercial dairy farms

Farm Scale	HS (%)	HAS (%)	HSC (%)	SC (%)	HSCAI (%)	HSAICA (%)	Total
Small	1(6.67)	3(20.00)	6(40.00)	4(26.67)	0(0.00)	1(6.67)	15
Medium	0(0.00)	2(5.26)	16(42.11)	6(15.79)	9(23.68)	5(13.16)	38
Large	0(0.00)	0(0.00)	3(42.86)	1(14.29)	3(42.86)	0(0.00)	7
Total	1(1.67)	5(8.33)	25(41.67)	11(18.33)	12(20.00)	6(10.00)	60

$\chi^2=13.5742$ P=0.19

N.B. HS=Hay and Straw; HAS=Hay, Straw and Atella (Local beer byproduct); HSC=Hay, Straw and Concentrate; SC=Straw and Concentrate; HSCAI=Hay, Straw, Concentrate and Alfalfa; and HSAICA=Hay, Straw, Alfalfa, Concentrate and Atella (Local beer byproduct).

Table 2: The constraints for feed availability among the different scale dairy farms

Farm Scale	FAP (%)	PIP (%)	FAPIP (%)	Total
Small	1(6.67)	5(33.33)	9(60.00)	15(100)
Medium	16(42.11)	9(23.68)	13(34.21)	38(100)
Large	5(71.43)	0(0.00)	2(28.57)	7(100)
Total	22(36.67)	14(23.33)	24(40.00)	60(100)

$\chi^2=10.6205$ P = 0.031

N.B. FAP= Feed Availability Problem; PIP=Price Inflation Problem; and FAPIP=Feed Availability and Price Inflation Problem.

Table 3: Association between the educational back ground of dairy farm workers and usage of feed formulation in dairy farms.

Educational background	Used feed formulation	Don't used feed formulation
Illiterate	2(28.57%)	5(74.43%)
Elementary	9(64.29%)	5(35.7%)
High school	10(71.43%)	4(28.58%)
Diploma	5(83.33%)	1(16.67%)
Certified(professionals)	7(100%)	0(0.00%)
BSc	10(90.91%)	1(9.09%)
Other	1(100%)	0(0.00%)
Total	44(73.33%)	16(26.67%)

$\chi^2 =5.5438$ P=0.476

Yayneshet [25] in Tigray Region, northern Ethiopia, reported as the marketing of different feed resources is a long held tradition in many parts of Tigray but the price of the feed resources is highly variable from district to district and hay is more expensive than crop residues [21] in Dandi District, Oromia Regional State, Central Ethiopia also reported that as shortage of feed is the first most important constraint for livestock production followed by animal health. Similarly, different studies done by Land [26] in Ethiopia, reported as supply shortage of feeds is considered as the main constrain for the development of the Dairy industry [27] in Western Oromia, reported shortage of feeds and cost of concentrates are among some of the bottlenecks in the dairy industry of the study area [28] in selected Kebeles of Adami Tullu, Jiddo Kombolcha District, reported that as feed shortage is the major constraint [29] in Tigray and Hararghe, reported as the constraints for the implementation of zero grazing in Tigray are shortage of feed in both quantity and quality, [30] in Ethiopia, reported that poor quality and quantity of feed resources are among the many constraints in the

country for the livestock production and [31] in Western Oromia, Ethiopia, reported as quantitative and qualitative inadequacy of feed is among the technical constraints observed to be responsible for low herd productivity.

In general, most of the studies conducted so far in the country indicated that feed availability both in quantity and quality, price inflations and market integration between dairy farmers and feed producers as the major constraints to the dairy industry of the country.

The present study also showed that as educational status of the dairy farm workers had a direct influence in the usage of feed formulation in their dairy farms. The majority of illiterate farm workers (74.43%) didn't use feed formulation in their dairy farms but the degree of usage of feed formulation by the educated ones was in accordance with their educational level. This has an impact on the dairy industry development and is supported by the findings of [26] in Ethiopia, who reported as knowledge of feed formulation and poor forage management are considered to be the main constraints for the development of the Dairy industry in the country.

CONCLUSION AND RECOMMENDATIONS

Livestock industry is an important and integral part of agricultural sector in Ethiopia where the huge cattle population and livestock sector has a significant contribution to the Ethiopian economy but production per animal is extremely low. Dairy industry is not developed as in other east African countries. The availability of feed resources and the nutritional quality of the available feeds are the most important factors that determine the productivity of livestock. According to the current research findings, hay, straw and concentrate feed composition type is the most commonly used feed composition by the different scale dairy farms. The major constraints identified in the present study in terms of feed resources at various dairy farms are both feed availability and price inflation problem. In addition, the educational status of the dairy farm workers has a direct influence in the usage of feed formulation in their dairy farms. Therefore, to fill the gaps seen in the current study an intensive promotion of extension work should be done to create awareness among the farm owners and workers about good feeding management practice, feed formulation and cultivation and treatment of forages and crop residues so as to minimize the scarcity of feed in dairy farms and maximize their productivity.

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