



**IMPACT OF FEEDING PRACTICES ON NUTRITIONAL QUALITY OF MILK OF BOVINE
CROSS BREEDS IN BUKOOLI CENTRAL BUGIRI DISTRICT**

BY

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DECLARATION

I AKELLO FLORENCE TEDDY solemnly declare that this research dissertation is mine and has not been in any way submitted to any institution for an academic award.

Sign.....



Date

7/11/2024.

Duisenberg University Arapai Saegwa

DEDICATION

The success of this research work is attributed to my family members especially my Husband because of the emotional, spiritual and financial support he rendered to me,

My parents, brothers and sisters for encouraging and giving material support, my friends for motivational words may the living God who has in abundance reward you always.

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ACRONYMS

N: Natural grazing no supplements.

ZS: Zero grazing + Supplements

NS: Natural grazing + Supplements.

PV: Precision Value

CV: Coefficient of Variation

SE: Standard Error

LSD: -Least Significant Difference.

TP: Total Protein

TF: Total Fat

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ABSTRACT

Dairy farming is a cornerstone of agricultural activities worldwide, contributing significantly to food security and economic development hence playing a pivotal role in rural livelihoods and food provision among households. On the other hand there have been concerns on the quality of milk in correlation with feeding practices

This study therefore investigated the impact of different feeding practices on the nutritional quality of milk of dairy cross breeds in Bukooli Central, Bugiri District. The total of 52 dairy farmers were randomly sampled to find out their feeding methods with the aim of ascertaining how these feeding methods affect milk quality specifically protein and fat content. The feeding methods recorded include natural pasture grazing, zero grazing, and mixed grazing systems. 26 milk samples across three feeding methods were purposively collected and taken to life line laboratory for analysis.

The results indicated that milk from natural pastures grazed dairy crosses had the mean protein content of 3.531%, zero grazed dairy animals had 6.714%, and 4.793% for mixed grazed dairy cattle, the mean fat content was 7.338% for naturally grazed, 10.750% for zero grazed and 8.662% for mixed grazed dairy cattle. A statistical analysis revealed significant differences in protein ($P = 0.001$) and fat ($P = 0.003$) content across the different feeding methods. The coefficient of variation (CV) for protein was 26.5% and for fat was 19.7%, indicating variability in milk composition due to the feeding practices. The standard error (SE) for protein and fat was 1.24 and 1.65 respectively, with the least significant difference (LSD) values of 1.383 for protein and 1.831 for fat.

The findings suggest that zero grazing results had the highest protein and fat content, followed by mixed grazing and then natural grazing. This demonstrates that controlled feeding practices that incorporate supplements and concentrated feeds, can significantly enhance the nutritional value of bovine milk. These results have important implications for dairy farmers in Bukooli Central and similar agro-ecological regions, where feeding strategies can be optimized to improve milk quality.

CHAPTER ONE: INTRODUCTION

1.1 Background:

Dairy farming is a cornerstone of agricultural activities worldwide, contributing significantly to food security and economic development (Haug et al., 2007a). In Uganda, agriculture is the backbone of the economy (David Balikowa, 2011), and dairy farming has emerged as a crucial sector, playing a pivotal role in rural livelihoods and food provision (Haug et al., 2007a). The Bugiri District, specifically Bukooli Central, is emblematic of this trend, where dairy farming has become an integral part of the socio-economic fabric.

The dairy industry in Bukooli Central has witnessed growth, with many households relying on dairy farming for income generation and sustenance (Srivastava, n.d.). However, the nutritional quality of dairy milk is subject to various factors, with feeding practices standing out as key determinants (Kashongwe et al., 2017). The diet of dairy cattle has a direct impact on the composition of milk (Magan et al., 2021), influencing its nutritional value and subsequently its impact on human health.

Despite the importance of this relationship, there is a notable dearth of research specifically investigating the intricate connection between feeding practices and the nutritional quality of dairy milk in Bukooli Central. Studies conducted in other regions and countries stress the significance of balanced nutrition for dairy cattle to enhance milk quality (Smith et al., 1997). However, extrapolating findings from diverse contexts may not fully capture the unique challenges and opportunities faced by dairy farmers in Bukooli Central. The aim of this research therefore was to determine the feeding practices used by farmers rearing the bovine species of animals and how it relates with milk quality in Bukooli central, Bugiri district.

1.2 Problem Statement:

Despite the economic and nutritional significance of dairy farming in Bukooli Central, Bugiri District, there is a critical gap in research addressing the specific factors influencing the nutritional quality of bovine milk. The nutritional composition of milk is intricately linked to various factors, among which feeding practices stand out as a primary determinant (Coulon et al., 1994). However, a comprehensive investigation into the relationship between feeding practices and the nutritional quality of dairy milk in this specific region is notably lacking.

REFERENCES

- Miao M and Jiang B (2014) the Kjeldahl Method: An Overview - Science Direct Topics.
<https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/Kjeldahl-Method>
- Control of milk fat production by diet is a book written by Bauman and Griinari that was published in 2003. 203–227 in Vol. 23, Annual Review of Nutrition the URL
[10.1146/annurev.nutr.23.011702.073408](https://doi.org/10.1146/annurev.nutr.23.011702.073408)
- Clarke, V., and Braun, V. (2023) Thematic analysis Research designs that are quantitative, qualitative, neuropsychological, and biological are covered in the APA Handbook of Study Methods in Psychology, Volume 2, Second Edition.
- (Pdf) mineral an important nutrient for efficient reproductive health in dairy cattle. (n.d.).
- Alstrup, I., Søgaard, K., & Weisbjerg, M. R. (2016). Effects of maturity and harvest season of grass-clover silage and of forage-to-concentrate ratio on milk production of dairy cows. *Journal of dairy science*, 99(1), 328–340. <https://doi.org/10.3168/jds.2015-9802>
- Bauman, D. E., & Griinari, J. M. (2003). Nutritional regulation of milk fat synthesis. In *Annual Review of Nutrition* (vol. 23, pp. 203–227).
<https://doi.org/10.1146/annurev.nutr.23.011702.073408>
- Coulon, J. B., Agabriel, C., Brunswig, G., Müller, C., & Bonaiti, B. (1994). Effects of feeding practices on milk fat concentration for dairy cows. *Journal of dairy science*, 77(9), 2614–2620. [https://doi.org/10.3168/jds.s0022-0302\(94\)77202-7](https://doi.org/10.3168/jds.s0022-0302(94)77202-7)
- Data collection SOP template _ template by Clickup™. (n.d.).
- David Balikowa. (2011). Dairy development in Uganda a review of Uganda's dairy industry. FAO and The Uganda National Apiculture Development Organisation (TUNADO), 3202(March), 1–215. <http://www.fao.org/3/a-aq292e.pdf>
- Devries, T. J. (2019). Feeding Behavior, Feed Space, and Bunk Design and Management for Adult Dairy Cattle. In *Veterinary Clinics of North America - Food Animal Practice* (Vol. 35, Issue 1, pp. 61–76). <https://doi.org/10.1016/j.cvfa.2018.10.003>

- DM Chisowa, IDT Mpofu, & MT Daura. (2023). Comparative evaluation of nutritive value of maize stover treated with chopped and mineralized groundnut and soybean stover. In *International Journal of Frontiers in Life Science Research* (Vol. 4, Issue 1, pp. 008–019). <https://doi.org/10.53294/ijflsr.2023.4.1.0055>
- Effects of Season Variation on Water , Feed , Milk Yield and Reproductive Performance of Dairy Cows in Smallholder Farms in Eastern Africa. (2020). <https://doi.org/10.9734/JAERI/2020/v21i830157>
- Haug, A., Høstmark, A. T., & Harstad, O. M. (2007a). Bovine milk in human nutrition - A review. *Lipids in Health and Disease*, 6, 1–16. <https://doi.org/10.1186/1476-511X-6-25>
- <http://programeval.ucdavis.edu>. (2011). Pilot Testing Data Collection Instruments. Centre for Evaluation and Research, May, 1–2. <http://tobaccoeval.ucdavis.edu/data-collection/conducting-surveys.html>
- Jayanegara, A., & Sofyan, A. (2009). Supplementary feeding on the nutrient balance of lactating dairy cow at contrasting temperature regimes: Assessment using cornell net carbohydrate and protein system (CNCPS) model. *Journal of the Indonesian Tropical Animal Agriculture*, 34(3). <https://doi.org/10.14710/jitaa.34.3.196-204>
- Kala, R., Samkova, E., Pecova, L., Hanuš, O., Sekmokas, K., & Riaukiene, D. (2018). An overview of determination of milk fat: Development, quality control measures, and application. In *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis* (Vol. 66, Issue 4, pp. 1055–1064). <https://doi.org/10.11118/actaun201866041055>
- Karunanayaka, R. H. W. M., Liyanage, R. T. P., Nayananjalie, W. A. D., Kumari, M. A. A. P., Somasiri, S. C., Adikari, A. M. J. B., & Weerasingha, W. V. V. R. (2021). Feeding Total Mixed Ration (TMR) on Production and Reproductive Performance of Lactating Dairy Cows: A Review. In *Agricultural Reviews* (Issue Of). <https://doi.org/10.18805/ag.r-208>
- Kashongwe, O. B., Bebe, B. O., Matofari, J. W., & Huelsebusch, C. G. (2017). Effects of feeding practices on milk yield and composition in peri-urban and rural smallholder dairy cow and pastoral camel herds in Kenya. *Tropical Animal Health and Production*, 49(5), 909–914. <https://doi.org/10.1007/s11250-017-1270-3>
- Kennedy, J., Dillon, P., Delaby, L., Faverdin, P., Stakelum, G., & Rath, M. (2003). Effect of

genetic merit and concentrate supplementation on grass intake and milk production with Holstein Friesian dairy cows. In *Journal of Dairy Science* (Vol. 86, Issue 2, pp. 610–621). [https://doi.org/10.3168/jds.S0022-0302\(03\)73639-X](https://doi.org/10.3168/jds.S0022-0302(03)73639-X)

Krejcie-morgan-sample-size-table. (n.d.).

Lindmark-Månsson, H., Fondén, R., & Pettersson, H. E. (2003). Composition of Swedish dairy milk. *International Dairy Journal*, 13(6). [https://doi.org/10.1016/S0958-6946\(03\)00032-3](https://doi.org/10.1016/S0958-6946(03)00032-3)

Lund, A., & Lund, M. (2023). Testing for Normality using SPSS Statistics when you have only one independent variable. (pp. 4–7). <https://statistics.laerd.com/spss-tutorials/testing-for-normality-using-spss-statistics.php>

Magan, J. B., O'Callaghan, T. F., Kelly, A. L., & mccarthy, N. A. (2021). Compositional and functional properties of milk and dairy products derived from cows fed pasture or concentrate-based diets. *Comprehensive Reviews in Food Science and Food Safety*, 20(3). <https://doi.org/10.1111/1541-4337.12751>

Minerals - Nutrient Requirements of Dairy Cattle - NCBI Bookshelf. (n.d.).

Monica, K. (2022). Influence of Dairy Farming Practices on Milk Production. A Critical Literature Review. *Animal Health Journal*, 3(1), 1–15. <https://doi.org/10.47941/ahj.771>

Ojha, S., Pathak, V., Goswami, M., Bharti, S. K., Singh, V. P., & Singh, T. (2017). Quality and safety assessment of cow' milk in different regions of Mathura city. *Nutrition and Food Science*, 47(3), 443–455. <https://doi.org/10.1108/NFS-05-2016-0067>

Optimizing Feed Intake in Dairy Cattle _ IFA's Helping to Grow Blog. (n.d.).

Penyelidikan, J. (2006). Sample size estimation using krejcie and morgan and cohen statistical power analysis: a comparison chua lee chuan jabatan penyelidikan. *Jurnal penyelidikan ipbl*, 7, 78–86.

Pulido, R. G., & Leaver, J. D. (2003). Continuous and rotational grazing of dairy cows - The interactions of grazing system with level of milk yield, sward height and concentrate level. In *Grass and Forage Science* (Vol. 58, Issue 3, pp. 265–275). <https://doi.org/10.1046/j.1365-2494.2003.00378.x>

- Smith, K. F., Reed, K. F. M., & Foot, J. Z. (1997). An assessment of the relative importance of specific traits for the genetic improvement of nutritive value in dairy pasture. *Grass and Forage Science*, 52(2). <https://doi.org/10.1111/j.1365-2494.1997.tb02347.x>
- Sofia, K., Sabrine, A. C. F., Nabil, A., Rofia, B., Mohamed, B., Nabil, B., & Chafia, C. (2023). Situation of Forage Crops Intended for Feeding Dairy Cattle in Some Breeding Farms in the Wilaya of Blida (Algeria). *Agricultural Science Digest*, 43(6), 870–876. <https://doi.org/10.18805/ag.DF-423>
- Srivastava, A. K. (n.d.). Developing dairy enterprise for ensuring food and livelihood security of the poorest of poor.
- Takele, D., Amanu, T., & Eba, B. (2014). Feed resources, feeding system and feed marketing for dairy production in the lowland and mid-highland agro-ecologies of Borana zone, Ethiopia. *International Journal of Innovation and Applied Studies*, 7(3).
- Walstra, P. (1999). Milk composition. In *Dairy Technology: Principles of Milk Properties and Processes*. Ed: Marcel Dekker Incorporated, New York, USA (pp. 27–107).
- Warakulle, S., Mohamed, H., Ranasinghe, M., Shah, I., Yanyang, X., Chen, G., Ayyash, M. M., Vincent, D., & Kamal-Eldin, A. (2024). Advancement of milk protein analysis: From determination of total proteins to their identification and quantification by proteomic approaches. In *Journal of Food Composition and Analysis* (Vol. 126). <https://doi.org/10.1016/j.jfca.2023.105854>