integrity Research Journals

Journal of Animal Science and Veterinary Medicine
Volume 9(5), pages 240-247, October 2024
Article Number: CDA516489
ISSN: 2536-7099
https://doi.org/10.31248/JASVM2024.491
https://integrityresjournals.org/journal/JASVM

Full Length Research

Evaluation of feed resources in dairy development programme areas of Oyo State, Nigeria

Umar, A. M.*, Abubakar, M., Kalla, D. J. U. and Mancha, Y. P.

Department of Animal Production, Abubakar Tafawa Balewa University, Bauchi, Nigeria.

*Corresponding author. Email: aumustapha@atbu.edu.ng

Received 4th October 2024; Accepted 26th October 2024

ABSTRACT: This research was conducted to compile a database of available feed resources for dairy cows in the Dairy Development Programme (DDP) areas of Oyo state in order to determine the forages that will be used for a future study. A total of 120 farmers, 20 from each of the 6 milk collection centres were interviewed separately using the Feed Assessment Tool and 3 were purposely selected for a focus group discussion after all the interviews. Results indicated that most farmers are landless, relying mostly on grazing from farms with leftover residues. Agriculture, aside from livestock, contributes 18.32% to the average household income. Wheat bran, palm kernel cake, and groundnut cake are among the top feedstuffs purchased, each contributing to approximately 12, 11, and 10%, respectively. The highest percentage of dry matter intake is attributed to grazing (50%), representing half of the total intake followed by purchased feed (18%), cultivated fodder (13%), collected fodder (12%) and crop residues (7%). On the other hand, while grazing (54%) takes the lead on the source of crude protein intake, purchased feed emerges as the second most substantial source of nutrition, contributing 16%. In conclusion, this database provided valuable insights for feed management practices in the region with a clear significant reliance on grazing as a primary source of both dry matter and crude protein intake, thus reflecting the importance of natural pastures in the region. To build on these findings, it is recommended that stakeholders, including farmers, extension workers, and policymakers, focus on improving access to and the quality of grazing lands and a sustainable feeding strategy for future guidance should be more specific and aligned with management systems, particularly when transitioning from extensive to intensive systems.

Keywords: Dairy development, cows, grazing, purchased feed.

INTRODUCTION

To ameliorate the problem of low-level protein intake, there is a need for various stakeholders to put concerted efforts towards increasing livestock output, especially products like milk because of its high nutritional content. Africa produces less than 10% of global output while Sub-Saharan Africa produces 0.2% of the global trade volume in the dairy sector (Lokuruka, 2016). The shortfalls in demand show potential investment opportunities and growth areas in the sector. This shortage in supply is mostly because of the low potential of indigenous breeds of cows.

One way through which local milk production can be increased is through increasing the nutritional intake of dairy animals (Umar *et al*., 2023). Improved yields can be obtained by optimising feed quality and feed intake, however, animals extensively grazed may consume feed containing anti-nutritional factors, leading to reduced nutrient digestibility and low output (Aganga and Tshwenyane, 2003).

In order to combat the issues highlighted, and to promote sustainable dairy farming practices, a dairy development programme (DDP) was established in the country by the largest dairy corporation in Nigeria (Friesland Campina, 2011) which brings small-scale farmers together,

thereby helping them to improve their production and even buy the milk produced by their lactating cows. The dairy development program plays a critical role in ensuring the long-term success and sustainability of the dairy industry. One of the limitations of the DDP is that it only concentrates on small clusters of farmers, thus, expanding the programme to include all milk producers could positively transform the production of dairy in Nigeria.

Therefore, the main objective of the study was to evaluate the feed resources utilized by dairy cows in the DDP areas.

MATERIALS AND METHODS

The study was conducted in the months of July and August of the year 2020 in the DDP areas of Oyo State. The DDP comprises five Local Government Areas (LGA) namely: Iseyin, Ibarapa, Saki West, Atiba and Itesiwaju. Geographic information system (GIS) mapping tools were used to determine the geography and coordinates of all cows within the DDP areas (Olutayo, 2003). The Feed Assessment Tool (FEAST) was used to determine the quantitative information on crop-livestock production, feed availability, feeding rations and qualitative information - perception of feed quality. Twenty farmers, in each of the selected clusters (two clusters from each LGA) were interviewed and three from each LGA were later gathered for a focus group discussion. Data output was obtained from the FEAST and presented in Figures for discussion.

RESULTS AND DISCUSSION

Characterisation of farmers using land information in the DDP areas

Farmland size varies among the households as shown in Figure 1. Depending on the landholding size, farmers in the DDP areas were classified into four categories: landless (0 hectares), small (<2 hectares), medium (2-5 hectares) and large (>5 hectares). The majority of farmers are landless, relying mostly on grazing from farms that have leftover residues.

The implication of the limited availability of natural grazing resources is that there may be a necessity for supplementary feeding. Landless farmers may need to explore alternative sources of feed, such as crop residues, agro-industrial by-products, or purchased feed, to ensure that the livestock receive adequate nutrition.

The characterization of farmers based on land information in the Dairy Development Programme (DDP) areas reveals significant disparities in landholding sizes among households. Fifty per cent of farmers in these areas are landless, relying predominantly on grazing from farms with leftover residues. This finding is consistent with earlier research conducted by Eeswaran *et al.* (2022) in semi-arid regions of West Africa, where landless pastoralists similarly depend on communal grazing and crop residues for livestock feeding. Such reliance on non-owned land resources is often indicative of the economic constraints faced by smallholder pastoralists, who struggle to secure private land ownership. In comparison, a study by Jayne *et al*. (2019) in East Africa reported that small and medium-scale farmers (holding less than 5 hectares) had better access to land, allowing them to cultivate fodder crops in addition to grazing. This access to land enabled a more stable and predictable supply of feed, directly impacting milk production positively. However, the predominance of landless farmers in the DDP areas emphasises the challenges they face in maintaining livestock productivity, which is further exacerbated by the seasonal availability of crop residues.

Average dairy cattle holdings per household in tropical livestock units

An average of 37 lactating local dairy cows were reported per household with maximum numbers exceeding 300 and a minimum of 7 cows (Figure 2). The number of local bulls per household was just 1 as compared to cross-bred bulls which measured up to 5 per household. Only 2 exotic bulls were reported (farmers having large landholdings and the highest number of Total Livestock Units- TLU). The implication of this is that farmers are now slowly adopting cross-breeding in order to improve milk yields.

Low-income and young farmers had many local dairy heifers and calves (25 TLU) while the cross-bred heifers and calves (Bunaji/Bokoloji X Friesian) were averagely reported to be 9 and 8 respectively. Cross-bred dairy cows that were lactating were reported to be 18 while dry cross-breds were 17. This compares with 18 cross-bred bull calves that were less than 24 months. These are most likely going to be the bulls that would be used for mating in the near future.

The study of average dairy cattle holdings per household, expressed in Tropical Livestock Units (TLUs), reveals a significant variation in herd composition across the surveyed households. An average of 37 lactating local dairy cows per household, with numbers ranging from 7 to over 300 cows, indicates a broad spectrum of dairy farming intensities in the DDP areas. This aligns with the findings of Fine and Lattimore (1982), who reported similar disparities in herd sizes in Southeast Asia, where large landholders tend to dominate dairy production, while smaller households manage more modest herds.

The relatively low average of 1 local bull per household, compared to the higher numbers of crossbred bulls (up to 5 per household), suggests a growing shift towards crossbreeding practices. This trend is further supported by the presence of only 2 exotic bulls, predominantly among

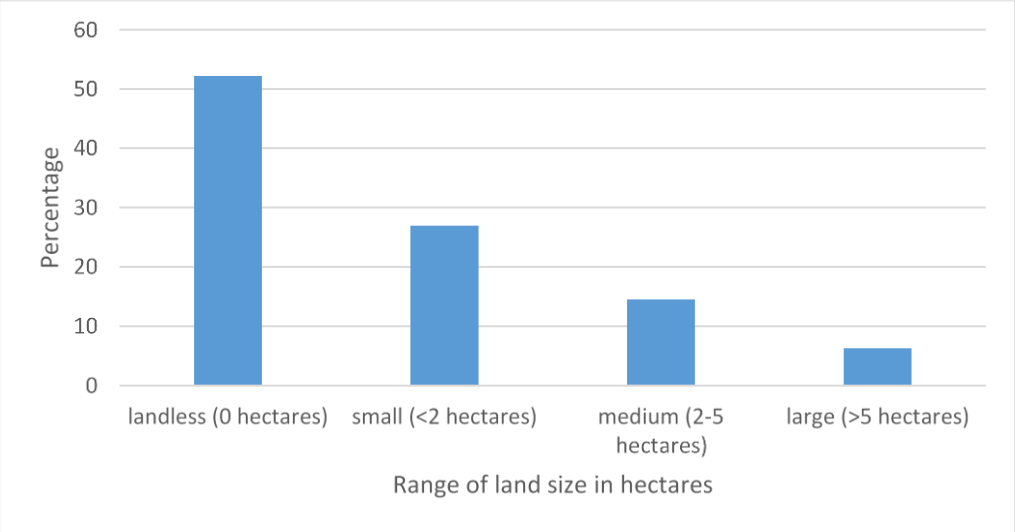

Figure 1. Households by land holding category.

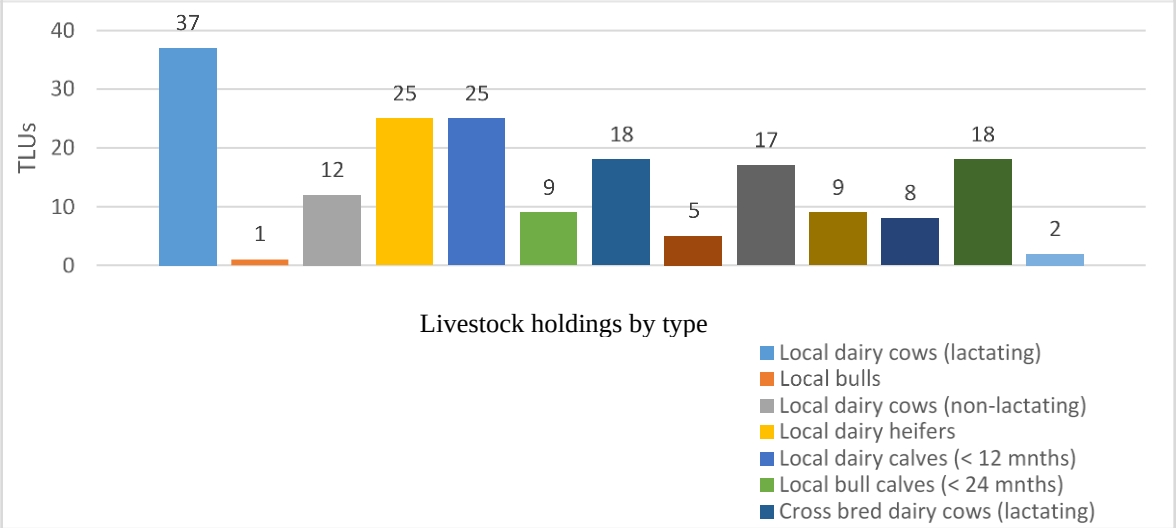

Figure 2. Average household livestock holdings by type in tropical livestock units.

farmers with larger landholdings and higher TLU counts. This mirrors the observations of Tsegaye (2016) in Ethiopia, where the adoption of crossbreeding has been steadily increasing, driven by the desire to enhance milk yields and overall herd productivity.

The higher number of local dairy heifers and calves (25 TLUs) reported among low-income and younger farmers reflects the economic constraints that limit access to crossbred animals. Conversely, the average of 9 and 8 crossbred heifers and calves, respectively, underscores the gradual but significant adoption of crossbreeding, even among less affluent farmers. This finding is comparable to the study by Desiso *et al*. (2018), which highlighted that crossbreeding adoption rates are often contingent on household income levels and access to breeding services.

The nearly equal numbers of lactating (18 TLUs) and dry crossbred cows (17 TLUs) suggest a balanced herd management approach among farmers adopting crossbreeding, aiming to maintain consistent milk production throughout the year. Additionally, the reported 18 crossbred bull calves under 24 months indicate a proactive effort by farmers to maintain a sustainable breeding program, as seen in the work of Ojango *et al.* (2016), where similar patterns of herd management were documented in Latin American dairy systems.

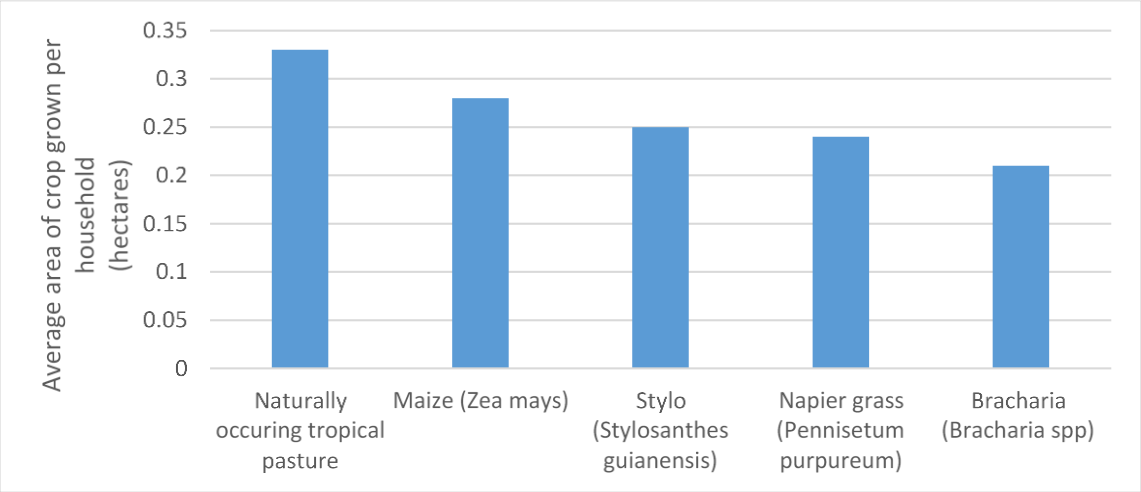

Figure 3. Cultivated fodder crops grown in DDP areas.

Average area allocated for cultivated fodder and natural pastures in DDP areas

The data in Figure 3 reveals a diverse range of forage sources employed in DDP areas, including naturally occurring tropical pasture, Maize stover, Stylo, Napier grass, and Bracharia. This diversity emphasises a strategic approach to forage management and the importance of providing a varied and balanced diet for livestock. Analysing the figures accompanying each forage source sheds light on the relative abundance of each type in the forage blend. Naturally occurring tropical pasture emerges as the most prominent source, constituting 33% of the forage mix, followed by Maize (28%), Stylo (25%), Napier grass (24%), and Bracharia (21%).

The prominence of naturally occurring tropical pasture, which constitutes 33% of the forage mix, underscores its vital role in the overall feed strategy. This finding aligns with the research conducted by Rufino *et al.* (2013), who documented the reliance on natural pastures as a key component of forage systems in East Africa. The study emphasized that the abundance of natural pastures is often linked to seasonal variations and land management practices, which can significantly influence forage availability and quality.

The significant contribution of maize (28%) and stylo (25%) to the forage mix reflects an increasing trend towards the integration of cultivated forages, which offer higher nutritional value and consistency compared to natural pastures. Similar trends were observed by Orodho (2006) in Kenya, where the cultivation of Maize grain and legumes like Stylo has become an essential practice for smallholder dairy farmers seeking to enhance milk yields. The inclusion of these high-energy and protein-rich forages in the diet of dairy cattle is particularly beneficial in improving milk production and overall herd health.

The presence of Napier grass (24%) and Bracharia (21%) in the forage mix further indicates a balanced forage strategy, as these grasses are known for their high biomass production and ability to thrive in tropical climates. Paul *et al.* (2020) noted the increasing popularity of Napier grass in East Africa due to its adaptability and high digestibility, making it a preferred choice for dairy farmers aiming to maximize forage production on limited land. Similarly, the adoption of Bracharia has been encouraged by its drought tolerance and ability to improve soil health, as highlighted by Labarta *et al.* (2017) in their study of forage systems in South America.

Dominant purchased feed types purchased in DDP areas

In Figure 4, cassava peels, both dry and fresh, emerge as the most prominent feed types, constituting 17 and 12%, respectively. This suggests a significant reliance on cassava by-products in livestock diets. Analyzing the economic aspects of feed choices is essential, as seen in the figure, Wheat bran, palm kernel cake, and groundnut cake are the top conventional feedstuff purchased, each contributing to approximately 12%, 11%, and 10%, respectively. Other Agro-industrial by-products and conventional feedstuffs include brewers dried grain, rice bran, bone meal, soybean meal, fish meal, and maize bran collectively contribute to 34% of the feed composition.

The heavy reliance on cassava peels is not surprising given its availability and affordability, making it a go-to choice for many farmers. Devi and Diarra (2019) found similar trends in their study, where cassava by-products were also favoured due to their high energy content and cost-effectiveness. The economic considerations behind feed selection become even clearer when looking at other

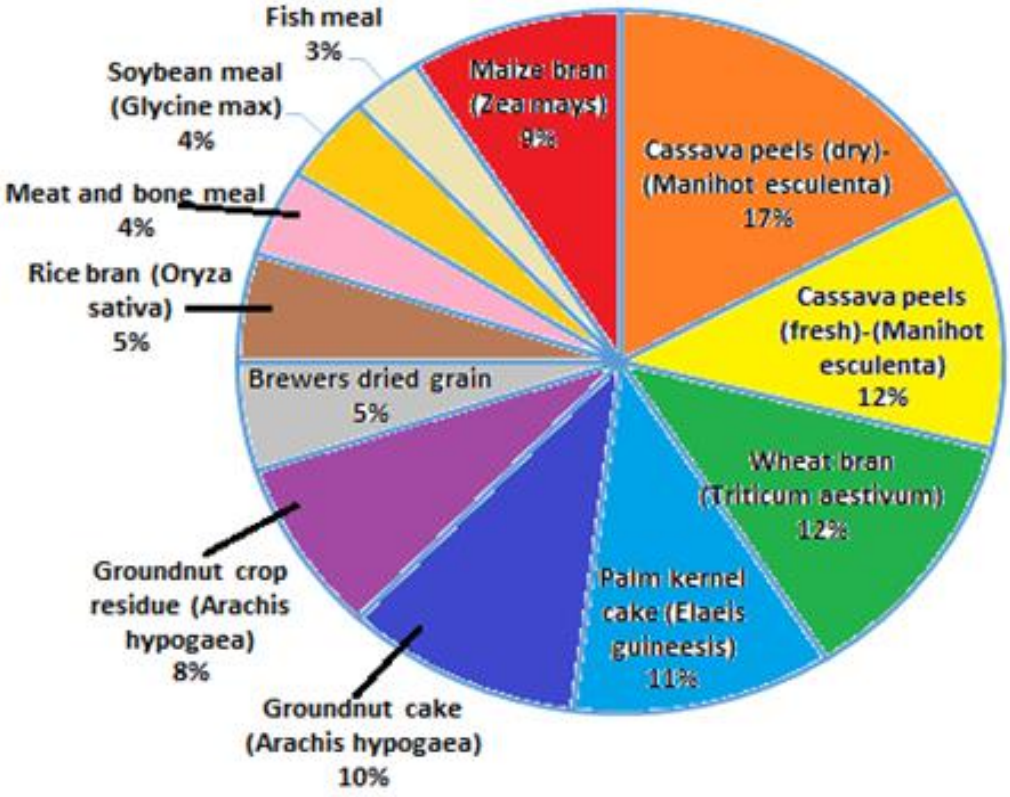

Figure 4. Average quantity of feed purchased per household by feed type.

popular choices like wheat bran (12%), palm kernel cake (11%), and groundnut cake (10%).

Interestingly, the collective contribution of other feedstuffs like brewers dried grain, rice bran, meat and bone meal, soybean meal, fish meal, and maize bran to 34% of the total feed composition suggests economic scarcity of feed for animals. Farmers are clearly balancing their feed types to ensure a complete ration for their livestock, which is crucial for maintaining animal health and productivity. This approach aligns with the argument of Salem and Smith (2008) who observed that feeding animals usually pressurizes resource-poor farmers, often leading the farmers to start another job to earn a livelihood, not just animal husbandry.

Contribution of feed resources to dry matter, metabolizable energy and crude protein content of the total diet in DDP areas

The values recorded in Figure 5 on dry matter intake by source in DDP areas shed light on the varied sources of nutrition for livestock. The highest percentage of dry matter intake is attributed to grazing (50%), which represents half of the total intake. This emphasises the significance of natural pastures and open grazing in the feeding regimen of livestock in DDP areas. Purchased Feed (18%) contributes a substantial portion of dry matter intake, indicating the reliance on external sources for supplementary nutrition. Crop residues (7%) contribute a modest but noteworthy percentage to dry matter intake. This source may encompass residues from crops like maize, rice, or other cultivated plants.

With 50% of the total dry matter intake attributed to grazing, it's evident that natural pastures and open grazing spaces are the backbone of the feeding regimen. This heavy reliance on grazing reflects both the availability and the accessibility of open land where livestock can freely feed. Similar trends have been observed in studies like Nakajima and Yashirota (2019) where grazing was identified as the primary source of nutrition for cattle that causes an imbalance in protein and energy intake and energy deficiency, thus impairing hormone production.

Crop residues, contributing 7% to the total dry matter intake, also play a modest yet important role. While not as dominant as grazing or purchased feeds, crop residues provide a valuable supplement to the diet, especially for smallholder farmers who often use these readily available resources to ensure an all-year-round availability of feed supplies. This is consistent with observations by Steinbach (1997) where crop residues were argued to be a critical component of livestock diets in mixed farming systems,

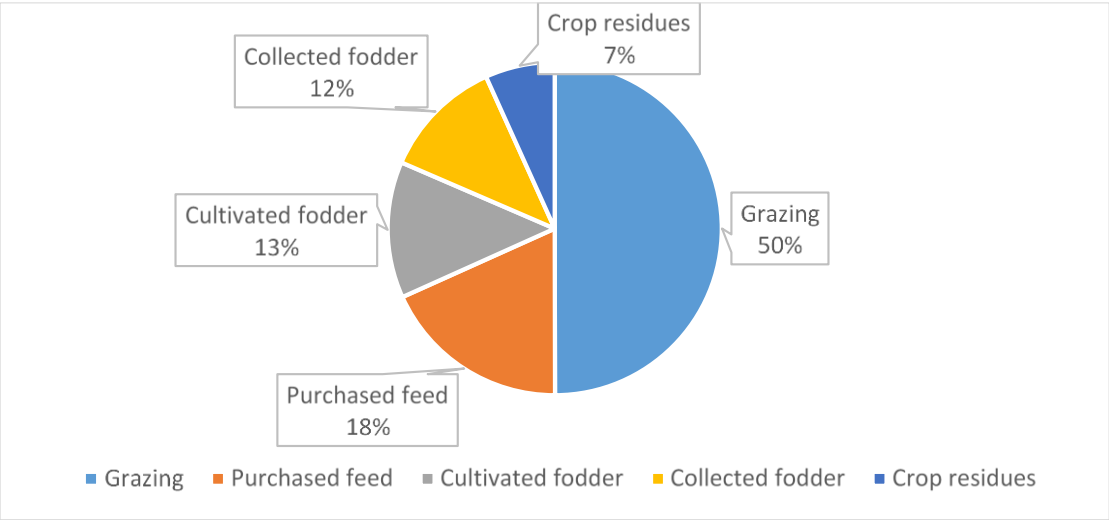

Figure 5. Dry matter intake by source (%).

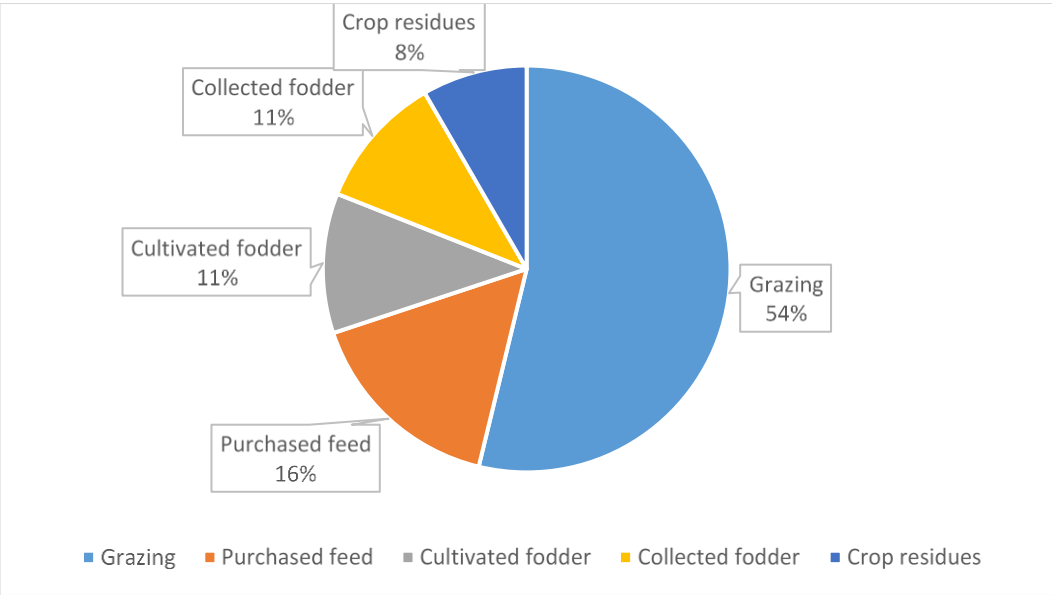

Figure 6. Crude protein intake by source (%).

providing an economical and accessible source of feed.

Figure 6 shows the distribution of crude protein intake sources in the DDP areas, highlighting a variation as demonstrated by the provided percentages. Grazing stands out as the predominant source, constituting 54% of the total crude protein intake. The substantial reliance on grazing reflects the significance of land access and utilization in meeting the nutritional needs of livestock in these areas. Additionally, the emphasis on natural grazing aligns with traditional livestock management practices, emphasizing the importance of sustainable land use.

While grazing takes the lead, purchased feed emerges as the second most substantial source of crude protein, contributing 16%. The integration of various protein sources, including crop residues, highlights the diversity in feeding practices, allowing for a more balanced and resilient approach to livestock nutrition in the dynamic context of DDP areas. This finding is consistent with traditional livestock management practices that prioritize sustainable land use and the preservation of natural pastures, as also noted in studies by Nakajima and Yashirota (2019), where grazing was emphasized as a

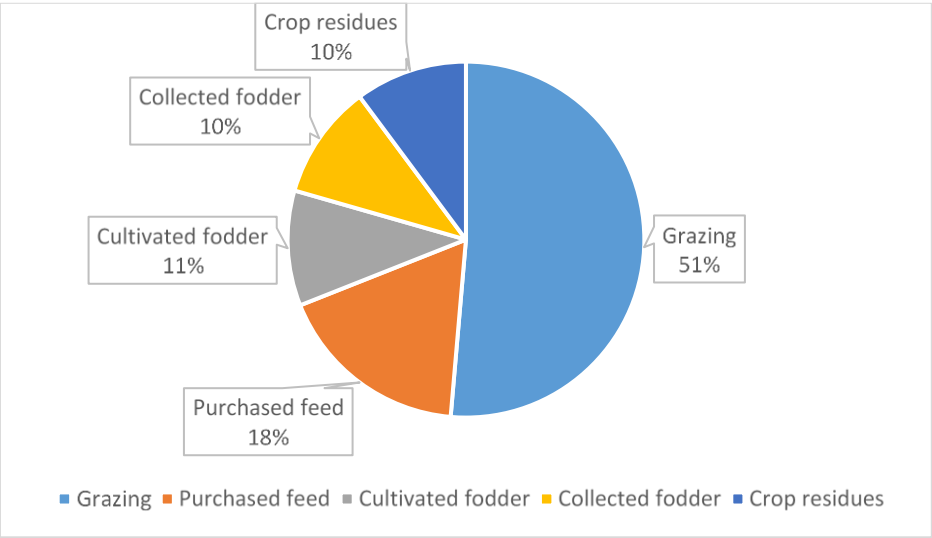

Figure 7. Metabolisable energy intake by source (%).

critical component of livestock diets.

The emphasis on grazing as a major protein source not only reflects the availability of natural pastures but also points to the economic and environmental benefits of utilizing these resources. By relying on natural grazing, farmers are able to minimize feed costs while maintaining a sustainable feeding strategy that aligns with the ecological conditions of the region. This approach is particularly important in areas where land resources are abundant and can be effectively managed to support livestock nutrition.

This reliance on external feed sources indicates that while natural pastures provide the bulk of the protein, they are often supplemented by purchased feeds to ensure a balanced diet, particularly during periods when grazing alone may not be sufficient. This trend is supported by Knaus (2016), who observed that dairy farmers all over the world are moving from extensive systems to intensive systems by supplementing their animals with concentrate-based total mixed rations in addition to grazing.

Grazing emerges as the primary source of energy, contributing 51% of the total metabolisable energy intake as shown in Figure 7. The dominance of grazing suggests a reliance on extensive and traditional livestock management practices, emphasizing the importance of sustainable land use and access to open spaces for grazing.

In addition to grazing, purchased feed constitutes 18% of the metabolisable energy intake, highlighting the economic dimension of energy supplementation. Cultivated fodder, collected fodder, and crop residues collectively contribute approximately 31% to metabolisable energy intake, showcasing a diversified strategy that incorporates intentional cultivation and utilization of naturally occurring forage resources.

The significant contribution of grazing to energy intake highlights the importance of land management and access, as well as the need to maintain healthy pastures to ensure that livestock receive adequate energy from natural sources. This reliance on grazing also reduces the need for costly external feeds, offering an economic advantage to farmers who can capitalize on naturally available resources.

Purchased feed, contributing 18% to the metabolisable energy intake, represents a crucial component of the overall energy strategy. This reliance on supplementary feed underscores the economic dimension of energy supplementation, particularly in scenarios where natural pastures might not fully meet the energy demands of livestock, especially during dry seasons or periods of poor pasture quality.

The remaining 31% of metabolisable energy intake comes from a mix of cultivated fodder, collected fodder, and crop residues. This diversification reflects on the farmers' approach to energy provision, where they intentionally cultivate fodder crops and utilize naturally occurring forage resources to enhance the energy intake of their livestock. The integration of these feed sources into the diet not only ensures a balanced energy supply but also optimizes the use of available resources. This diversified energy strategy is supported by Gupta *et al*. (2012), who noted that a combination of cultivated fodder and crop residues significantly contributes to the energy intake of livestock in mixed farming systems.

Conclusion

In conclusion, the study reveals that landless farmers in

the Dairy Development Programme areas of Oyo State rely majorly on grazing for dairy cow feed, with leftover crop residues playing a significant role. Grazing accounts for the largest portion of both dry matter intake and crude protein intake, while purchased feedstuffs like wheat bran, palm kernel cake, and groundnut cake are important contributors to dairy cows' nutrition in the DDP area. These findings provide insights into the feed resources and their contributions and thus could be used as a guide for future research on sustainable feeding strategies for dairy cows in the dairy development areas of Oyo State, Nigeria. It is recommended that a sustainable feeding strategy for future guidance should be more specific and aligned with management systems, particularly when transitioning from extensive to intensive systems.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

REFERENCES

Aganga, A. A., & Tshwenyane, S.O. (2003). Feeding Values and Anti - Nutritive Factors of Forage Tree Legumes. *Pakistan Journal of Nutrition*, *2*(3), 170-177.

Desiso, F., Nega, B., & Sinote, B. (2018). Determinants of adoption of dorper black head Somali crossbred sheep in pastoral areas: the case of Yabello District, Southern Oromia, Ethiopia. *Journal of Development and Agricultural Economics*, *10*(10), 317-327.

Devi, A., & Diarra, S. S. (2019). Maximum utilisation of available resources for efficient poultry feeding in the South Pacific: major issues and prospects. *World's Poultry Science Journal*, *75*(2), 219-234.

Eeswaran, R., Nejadhashemi, A. P., Faye, A., Min, D., Prasad, P. V., & Ciampitti, I. A. (2022). Current and future challenges and opportunities for livestock farming in West Africa: Perspectives from the case of Senegal. *Agronomy*, *12*(8), 1818.

Fine, J. C., & Lattimore, R. G. (1982). *Livestock in Asia: issues and policies*. IDRC, Ottawa, ON, CA.

Friesland Campina (2011). Dairy Development Programme. Retrieved 12th July 2020 from https://www.frieslandcampina.com.ng/sustainability/dairy-development/.

Gupta, V., Rai, P. K., & Risam, K. S. (2012). Integrated crop-livestock farming systems: A strategy for resource conservation and environmental sustainability. *Indian Research Journal of Extension Education, Special Issue*, *2*, 49-54.

Jayne, T. S., Muyanga, M., Wineman, A., Ghebru, H., Stevens, C., Stickler, M. Chapoto, A., Anseeuw, W., Westhuizen, D., & Nyange, D. (2019). Are medium-scale farms driving agricultural transformation in sub-Saharan Africa? *Agricultural Economics*, *50*, 75-95.

Knaus, W. (2016), Perspectives on pasture versus indoor feeding of dairy cows. *Journal of Science Food and Agriculture*, *96*, 9-17.

Labarta, R., Martinez, J. M., Yaccelga, A., Reyes, B., Gomez, L., Maredia, M., DeYoung, D., Carriazo, F., & Toro, M. (2017). Assessing the adoption and economic and environmental impacts of Brachiaria grass forage cultivars in Latin America focusing on the experience in Colombia. Final Technical Report prepared for the CGIAR Standing Panel on Impact Assessment.

Lokuruka, M. N. (2016). Overview of dairy processing and marketing in East African dairy value chains: Opportunities and challenges. *African Journal of Food Science, 10*(11), 254-262.

Nakajima, N., & Yashirota, M. (2019). Effects of grazing on cattle health from physiological, immunological and nutritional perspectives, *Journal of Animal Behavior and Management*, *55*(4), 143-153.

Ojango, J. M., Wasike, C. B., Enahoro, D. K., & Okeyo, A. M. (2016). Dairy production systems and the adoption of genetic and breeding technologies in Tanzania, Kenya, India and Nicaragua. *Animal Genetic Resources/Resources génétiques animales/Recursos genéticos animales*, *59*, 81-95.

Olutayo, B. (2003). Towards an increasing awareness and use of remote sensing and geographical information systems in veterinary medicine in Nigeria. *Proceedings of IEEE International Geoscience and Remote Sensing Symposium, IGARSS 2003 (IEEE Cat. No.03CH37477),* Toulouse, France. *4*, 2962-2963.

Orodho, A. B. (2006). *The role and importance of Napier grass in the smallholder dairy industry in Kenya*. Pp. 1-36. Retrieved 12th August, 2024 from https://www.doc-developpement-durable.org/file/Culture/Culture-fourrages/herbe_a_elephant/Pennisetum%20purpureum/role%20of%20napier%20grass%20in%20Kenya.pdf.

Paul, B. K., Groot, J. C., Maass, B. L., Notenbaert, A. M., Herrero, M., & Tittonell, P. A. (2020). Improved feeding and forages at a crossroads: Farming systems approaches for sustainable livestock development in East Africa. *Outlook on Agriculture*, *49*(1), 13-20.

Rufino, M. C., Thornton, P. K., Mutie, I., Jones, P. G., Van Wijk, M. T., & Herrero, M. (2013). Transitions in agro-pastoralist systems of East Africa: impacts on food security and poverty. *Agriculture, Ecosystems & Environment*, *179*, 215-230.

Salem, H. B., & Smith, T. (2008). Feeding strategies to increase small ruminant production in dry environments. *Small Ruminant Research*, *77*(2-3), 174-194.

Steinbach, J. (1997). Alternatives to crop residues as feed resources in mixed farming systems (Chapter 10). In: *Crop residues in sustainable mixed crop/livestock farming systems*. Pp. 197-213. Retrieved from https://oar.icrisat.org/1046/1/RA_000315.pdf#page=212

Tsegaye, K. (2016). *Assessment of milk production and marketing systems, and effect of concentrate supplementation on milk production and economic return of crossbred dairy cows in Bona zuria woreda of Sidama zone* (Doctoral dissertation, Hawassa University).

Umar, A., Jatutu, S. S., Alhassan, A., & Inuwa, H. M. (2023). Steaming up Bunaji Cattle using Maize and Wheat Bran concentrates. *Animal-Science Proceedings*, *14*(2), 320-321.