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A Review of Open Grazing Practices and their Roles in the Epidemiology and Control of Intestinal Helminthiasis in Cattle in Nigeria

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ABSTRACT

Open grazing, a traditional cattle management practice, allows herders to guide cattle across open land, providing access to diverse forages, grasses, and legumes. However, this practice is linked to an increased risk of intestinal helminth infections, a persistent health challenge in regions reliant on open grazing. This narrative review synthesizes findings from peer-reviewed articles, reports, and relevant literature to explore the impact of open grazing on the epidemiology of intestinal helminths in cattle. It highlights current knowledge, challenges, and gaps, particularly regarding control measures, underscoring the need for targeted interventions to reduce helminth infections in cattle managed under open grazing systems.

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INTRODUCTION

Intestinal helminthiasis is an important global health issue among livestock, it is caused by parasites including nematodes, cestodes, and trematodes that live in the gastrointestinal tracts of infected animals (Perry et al., 2002). It is a significant public health and economic concern for both farmers and their livestock because it causes a wide range of clinical symptoms such as weight loss, diarrhea, anemia, and, in severe cases, death in livestock including cattle (Perry et al., 2002; Swai et al., 2006). The livestock industry in Nigeria contributes significantly to the agricultural economy, and the burden of helminth infections in cattle production is particularly concerning in regions where cattle are raised and traditional management practices are widely prevalent (Swai et al., 2006; Kuil, 2009; Agbajelola et al., 2018).

In most pastoralist communities in Nigeria, large herds of cattle are allowed to move freely and graze on pastures and sometimes farmlands under the passive supervision of individuals (popularly known as herdsmen) who mostly follow them and sometimes lead them through several grazing routes in plain fields and grasslands in search of pasture, and water for their animals in a system of cattle management referred to as open grazing (Ezeonwuka and Igwe, 2016; Nnoruga, 2021)

By implication, these cattle can graze on growing forage, grasses, legumes, and crops along their travel pathways (Chukwuemeka et al., 2018; Nnoruga, 2021). Meanwhile, the cattle also provide manure for the land when they pass out excreta onto the same land where they graze thus helping to fertilize the soil and contribute to sustainable land use by maintaining biodiversity and supporting the ecosystem since these herdsmen often lead them across several regional and sometimes national boundaries in search of food and water (Blench, 1994; Waters-Bayer and Bayer, 1994). However, open grazing practices can play critical roles in the epidemiology of animal disease prevention and control because it involves, on one hand, the extensive animal movement across large areas which can lead to stress and immunosuppression, and on the other hand the exposure of cattle to several parasites and organisms on contaminated pastures and water sources.

Given that cattle are at an increased risk of immunosuppression, stress, and continuous exposure to the eggs and larvae of intestinal helminths on contaminated pastures and water bodies (Akande et al., 2010; Onyali et al., 2014), as well as the difficulties in applying systematic control measures among infected herds in open grazing practices of cattle management (Nginyi et al., 2001; Nwosu et al., 2007). This review, therefore, seeks to highlight the impacts of open grazing on the epidemiology of intestinal helminthiasis and the challenges of implementing control measures in the open grazing practice in Nigeria.

This review follows a narrative literature review approach, aimed at synthesizing existing knowledge on the prevalence and impact of intestinal helminths in cattle due to open grazing in Nigeria. The review draws on peer-reviewed articles, reports, and relevant grey literature obtained from academic databases including PubMed, AJOL, SCOPUS, and ScienceDirect. Keywords and search terms such as "open grazing," "intestinal helminths," "cattle," and "Nigeria" guided the literature search. Studies were included based on relevance to the topic, publication date, and availability of detailed information on the impact of open grazing on cattle health related to helminth infections. This method did not employ strict inclusion criteria or formal quality assessments, which are typically associated with systematic reviews. Data were summarized narratively to highlight trends, challenges, and knowledge gaps within the context of Nigerian cattle grazing practices. This synthesis focuses on thematic patterns rather than quantitative meta-analysis.

The Burden of Intestinal Helminths in Cattle

Helminth infections caused by nematodes (roundworms), cestodes (tapeworms), and trematodes (flukes) are a global health concern for cattle of all ages. Common intestinal roundworms of cattle include *Ostertagia* sp. (stomach worm), H*aemonchus* sp. (Barber Pole Worm), *Cooperia* sp., *Trichostrongylus* sp., and *Strongyloides* sp., which affect the various parts of the intestines such as abomasum, stomach, and small intestines leading to anemia and weakness. Flukes including *Fasciola hepatica* (liver Fluke) and *Paramphistomum* sp. (rumen fluke) primarily affect the liver and rumen respectively, although their immature flukes can migrate through the intestine and cause significant damage to the intestinal mucosa. Tapeworms like *Moniezia* sp., and *Taenia* sp., live in the intestines and are generally considered less pathogenic but can lead to growth issues in heavy infestations (Urquhart et al., 1996).

Haemonchus contortus, *Ostertagia ostertagi,* and *Fasciola hepatica* are some of the most common helminths affecting cattle in Nigeria, and these parasites have continued to significantly impact the health and productivity of cattle by causing damage to the abomasum, stomach lining and liver of both calves and cattle, leading to poor nutrient absorption, weight loss, decreased milk production, anemia, and even death in heavily infected animals (Adedipe et al., 2014; Agbajelola et al., 2015). Some helminths' lifecycles involve several stages of development in which eggs are passed out and hatched in the environment, while others involve the passing out of free-living larvae from infected cattle into the environment (Agbajelola and Agbajelola, 2025). In both cases, the environment (mostly pastures and water) becomes contaminated and infected when these infective stages are ingested by grazing cattle (Fagbemi et al., 1995; Urquhart et al., 1996).

Similarly, the infection rate can become higher when other environmental factors such as temperature and humidity contribute to the survival of eggs and free-living larvae (Fagbemi et al., 1995; Agbajelola, 2025). Infected cattle show several signs ranging from poor weight gain to complete emaciation, reduced milk production in dams, and increased susceptibility to other diseases because of immunosuppression (Swai et al., 2006). The economic impact of intestinal helminthiasis is considerable, because the costs associated with treatment and control, alongside the loss of productivity, significantly affect the livelihood of farmers (Swai et al., 2006).

In addition to the direct health impacts, helminth infections also cause substantial financial losses for cattle farmers in Nigeria, including reduced weight gain, lower milk yield, decreased reproductive performance, and increased mortality, which all translate to significant reductions in market value and income (Strydom et al., 2023). The cost of anthelmintic drugs, veterinary consultations, and preventive measures further adds to the economic burden (Agbajelola, 2025). For example, *Fasciola hepatica* infections in cattle have been estimated to cause up to 30% production losses in some

Nigerian farming systems, while severe nematode infestations can lead to carcass condemnation during meat inspection, directly affecting farmers' revenue (Strydom et al., 2023; Agbajelola and Agbajelola, 2025). When aggregated nationally, these yield reductions and treatment costs represent millions of Naira in annual losses, threatening the livelihoods of pastoralists and smallholder farmers who depend heavily on cattle for income and food security.

Open Grazing in Nigeria

Pasture management and methods of grazing practices are important factors contributing to disease prevalence in cattle, more so, the effect and intensity of infection are determined by the immune status, the presence of infective larvae/eggs, as well as intermediate host(s) in the environment (FAO, 2000). In Nigeria, open grazing is one of the most common types of pasture and grazing practices, it is also a common traditional practice that is deeply entrenched in the culture and socio-economic fabric of most communities, particularly among the Fulani pastoralists in Nigeria Blench, 1994; Waters-Bayer and Bayer, 1994). It is regarded as an economically viable substitute by smallholder cattle farmers because it involves low to no input costs, as it simply relies solely on natural resources (free pastures and water elsewhere), unlike other grazing systems like rotational grazing, zero grazing, and intensive grazing that require more input cost and controlled management of livestock and pastures (Bransby, 1994; Fratkin and Mearns, 2003; Cardoso et al., 2011).

Open grazing method of cattle management is not just an economic activity but more of a way of life among cattle owners that has been practiced from one generation to another, thus it holds significant cultural importance in Nigeria, particularly among pastoralist communities (Fratkin and Mearns, 2003). The practice of open grazing provides economic relief to farmers and herders in these communities in terms of low-to-no operational costs and the ability to exploit vast portions of lands for livestock production, however, it poses several cultural, socio-economic, and religious challenges, including land use disputes among other communities, environmental degradation, destruction of farmlands, and increases in the risk of disease transmission to cattle (Fratkin and Mearns, 2003; Cardoso et al., 2011).

A major challenge of the open grazing method in Nigeria is the changing weather patterns and prolonged droughts affecting water and pasture availability up north, which has led pastoralists to migrate their cattle route down south in search of fresh pastures and cooler water sources. The encroachment of cattle herders towards the south has led to several land conflicts between pastoralists/herdsmen and crop farmers whose farmlands are constantly being invaded and destroyed by cattle in search of vegetation, and this destruction of crop farms by grazing cattle is affecting the livelihoods of farmers, leading to food insecurity and a reduction in agricultural output (Adelakun et al., 2015; Nnoruga, 2021). Similarly, open grazing encourages

continuous grazing in the same areas (overgrazing), which often depletes vegetation cover through soil erosion, reduces soil fertility, and leads to desertification and land degradation which will ultimately affect agricultural productivity (Adewumi and Olaleye, 2011; Nnoruga, 2021).

Grazing cattle often contaminates water sources (rivers/streams) used by local communities, leading to waterborne diseases, and it has been shown that open grazing can facilitate the spread of zoonotic diseases and other animal diseases such as Foot-and-Mouth Disease (FMD), anthrax, and trypanosomiasis (FAO, 2000; Ofem and Iyang, 2014; Opiyo et al., 2014). With this, open grazing can pose challenges for animal disease surveillance and control, as it involves extensive movement of animals across large areas.

Moreover, the difficulty of managing and regulating open grazing practice is a threat to its sustainability in Nigeria because the movement of herders across several regions has been associated with increased reports of criminal activities like banditry, cattle rustling, and in some extreme cases, militancy, kidnappings, and terrorism activities which have destabilized several families and communities in affected regions (Adewumi and Olaleye, 2011; Opiyo et al., 2014; Nnoruga, 2021). Indeed, the economic costs of conflicts, including loss of productivity, healthcare for injured persons, and rebuilding of destroyed properties, are significant. Apart from its cost-effectiveness and popularity in Nigeria, open grazing has become a major environmental and health menace because not only the ecosystem including the soil, water, forest resources, and biomass are facing the threat of extinction and degradation due to the activities of cattle rearing in several parts of the country, human and animal lives are also at risk of being lost because of ethnic and religious crises.

Impact of Open Grazing on The Epidemiology of Helminthiasis

The constant movement of cattle across different geographical locations tends to not just predispose them to stress and exhaustion especially through prolonged journeys, but also increase their exposure to contaminated pastures and water sources which are often shared with other animals and wildlife, thus, open grazing can contribute to immunosuppression through stress and exhaustion and facilitate the spread of infective eggs and larvae across different geographical regions, leading to higher infection rates among other cattle drinking from contaminated water (Schnyder et al., 2005). Similarly, the movement of cattle across long distances and into newer areas during open grazing can respectively introduce helminth eggs/larvae to new areas and spread infections among different herds (Charlier et al., 2014) because seasonal migrations in search of pasture and water can expose cattle to new and different species of helminth prevalent in different regions.

In open grazing, cattle often graze on the same land without adequate rest periods, and they can easily contaminate the environment (pasture) with helminth eggs and larvae, leading to a higher infection rate and burden (FAO, 2000). Overstocking and poor pasture management, which is a common challenge in this grazing system can then worsen this situation because of limited grazing areas. Furthermore, many cattle that become sick or immunosuppressed in transit remain untreated because of the lack of or inadequate diagnostic and deworming programs for them while in transit, thus infected animals and parasites continue to spread disease within the herd (FAO, 2000).

Studies have revealed that helminth infection is generally much higher among cattle raised under open grazing systems compared to those raised in more controlled grazing environments (Ilemobade et al., 1982; Nwosu et al., 2007; Van Dijh and Morgan, 2008). Nwosu et al. (2007) while comparing helminth infection rates in different grazing systems found out that cattle raised on the rotational and zero grazing systems of management had consistently lower infection rates due to better pasture management practices and deworming programs, as compared to those raised on open grazing practices

Further studies have also revealed that an open grazing system often leads to increased exposure to contaminated pastures due to the challenges associated with implementing effective parasite control measures (Ilemobade et al., 1982; Fabiyi, 1987). More so, pasture hygiene and rotation are difficult to achieve in open grazing systems, hence the grazing areas are continuously being contaminated, meanwhile, the tropical climate conducive to the development and persistence of infective stages of these helminths continues to further worsen the problem by providing optimal conditions for the development and survival of helminth larvae (Ilemobade et al., 1982).

Several studies have equally shown the progressive prevalence of helminths in cattle across travel paths of cattle across various regions of Nigeria; Ogunrinade and Ogunrinade (1980) reported a significant prevalence of *Fasciola hepatica* among cattle grazing in wetland areas, while Nwosu *et al.* (2007) observed higher infection rates (exceedingly over 70%) of *Haemonchus contortus* and other nematodes in some regions in the northern parts of Nigeria where the open grazing is predominant. According to Anene *et al.* (1994), the type of grazing practices influences helminth prevalence across several regions in Nigeria. In Northern Nigeria, where open grazing is mostly practiced, helminth infections tend to be higher than in the Southern areas, where mixed farming and more controlled grazing practices are common (Anene et al., 1994).

Challenges in Implementing Control Measures Against Helminths in Open Grazing System

There are several challenges that the open grazing system poses to the implementation of control measures against helminth among cattle, some of these challenges are fundamentally due to the nature and traditions of the practice among herders, the cultural and socio-economic implications, as well as the perceptions towards the practice in several regions in Nigeria. Managing and rotating pastures is difficult in open grazing systems because of the lack of well-defined fenced or designated grazing areas, this poses a hindrance to the maintenance of pasture hygiene such as the prompt removal of feces, contaminated feed, and water (Bransby, 1994), cattle on open grazing are therefore at risk of continuously grazing on contaminated pastures, thus increasing the chances of perpetuating the infection cycle (Bransby, 1994).

Another hindrance to the implementation of control is the nature of open grazing, in that, cattle and herdsmen often have wide and uncontrolled movement patterns – the cattle's extensive and often unpredictable movement makes it difficult to institute regular and uniform control measures and follow-up (Nwosu et al., 2007). Without a regularized and coordinated deworming program, many cattle will remain untreated, while these helminths will continue to breed and spread among the herd, thus exacerbating the persistence of infections. More so, the identification and collection of cattle for treatment (deworming, vaccination, and other health interventions) is often challenging, particularly in remote areas with limited infrastructure. Therefore, the enthusiasm of animal health practitioners and veterinarians to administer treatments and consistently monitor the effectiveness of deworming programs, treatment schedules, and drug resistance may be dampened because of the frustration they might experience in re-identifying cattle and following up treatments. Hence, the activities of quacks and imposters will only increase to the disadvantage of animals and herders.

Among some pastoralists with large herds and limited resources, the cost of anthelmintics and other veterinary services can be prohibitive for many pastoralists, and the resistance to adopting modern animal health practices can be strong in communities that have relied on traditional methods for generations (Van Wyk and Mayhew, 2013). This lack of awareness and understanding about the importance of helminth control and the benefits of anthelmintics often leads to poor compliance with recommended practices and an increase in infection rate among cattle. Meanwhile, most open grazing areas do not even have the necessary infrastructures (cattle chutes, ranching pens) for handling, isolating sick animals, and administering treatments to cattle, and in many rural and remote grazing areas, access to veterinary services and supplies is limited, making it difficult to obtain necessary treatments and professional advice (Charlier et al., 2014).

In practice, the cattle raised under open grazing systems are increasingly exposed to pastures contaminated with helminth eggs and larvae shed by other infected animals when they move over extensive areas, increasing their exposure to new infections from contaminated soils, plants, and water sources natural water sources such as rivers, ponds, and streams especially in areas where water sources are shared among various livestock and wildlife (Ilemobade et al., 1982). Similarly, cattle grazing on communal or public grazing lands where multiple herds from different owners graze together can increase the likelihood of inter-herd transmission of parasites as infected animals can easily contaminate shared grazing areas with helminth eggs and larvae through their feces (Nginyi et al., 2001; Schnyder et al., 2005). High stocking densities and continuous grazing on the same pastures can lead to high levels of pasture contamination with helminth eggs and larvae, perpetuating the cycle of infection (Ilemobade et al., 1982).

Seasonal changes in weather and pasture availability also affect the transmission dynamics of helminths, making it challenging to plan timely interventions effectively. The tropical climate in Nigeria is characterized by high temperatures and humidity, and it provides optimum conditions for the helminth eggs and larvae to develop and survive in the environment, hence, pastures remain contaminated for extended periods, becoming a constant source of infection for grazing cattle (Fagbemi et al., 1995).

Furthermore, the very nature of the helminth infection cycle in open grazing systems magnifies the challenge of control, as infected cattle shed eggs onto pastures during grazing. While these eggs develop into infective larvae under favorable tropical conditions, and because there is no controlled rotation or resting of pastures, the same cattle, or other herds moving through the area, are likely to ingest the larvae during subsequent grazing. This continuous grazing on contaminated land results in a closed reinfection loop that sustains high infection rates. In open-grazing contexts, the mobility of herds further spreads infective stages along migratory routes, contaminating new pastures and water sources. Such widespread and repeated environmental contamination means that even when deworming is carried out, reinfection can occur rapidly, often within days or weeks, rendering control measures less effective unless integrated with pasture management and herd movement strategies.

CONCLUSION and RECOMMENDATIONS

The inadequate infrastructure and resources among many pastoralist communities dedicated to the practice of open grazing hinders the implementation of systematic control programs, meanwhile, the current strategies for controlling helminth infections among cattle raised on open grazing are not sustainable because of the heightened risks of exposure to contaminated pastures, favorable environmental conditions for

parasite development, lack of systematic deworming, and challenges in pasture management. More so, the practice of open grazing predisposes to communal conflicts and cultural tensions among land dwellers across regions and routes of movement.

To address all the discomforting concerns, governments, and local authorities should implement controlled grazing programs that aim to balance livestock mobility with sustainable land use by designating specific grazing zones to manage livestock movement to prevent overgrazing and then establishing comprehensive deworming campaigns and regular vaccination schedules for cattle. Also, the government and private individuals can develop a livestock coverage scheme for pastoralists that provides pastoralists with financial security in cases of loss of cattle due to helminth infections in cattle - this will help reduce the need for overstocking herds and reduce the transmission of diseases among cattle. Veterinary health providers in partnership with the governments can also provide affordable and accessible animal healthcare services to herders by introducing itinerant veterinary units in remote grazing areas to offer preventive care, treatment, and health education to pastoralists.

Furthermore, other community leaders and stakeholders should be encouraged to partner with and patronize neighboring pastoralist communities by supporting the creation of inter-community markets that encourage pastoralists to sell livestock products such as milk, meat, and hides at fair prices - this will directly boost their socio-economic status and indirectly discourage the need to overstock herds for economic survival. These recommended interventions will not only relieve the negative effects of open grazing but also transform it into an opportunity for economic development, environmental sustainability, and social stability in Nigeria.

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Conflict of Interest

The authors have no conflict of interest regarding the publication of this article.

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