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The Polythene Menace in Animal Production

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ABSTRACT
This review of scholarly articles was conducted to explore the silent pandemic caused by polytine menace in animal production. Plastic pollution, particularly from polythene, poses a growing threat to animal production systems and the environment. The growing demand for animal products is fueled by population growth, higher income levels, health awareness, education and urbanisation. This calls for efforts at increasing animal production. Unfortunately, the few animals we have are exposed to environmental pollutants, particularly plastic waste. Due to its low biodegradability, polythene poses serious health risks to the environment, animals and humans. Due to improper disposal of some polythene products, animals may ingest them and this leads to digestive issues, malnutrition and sometimes, death. Additionally, the wider environmental consequences of plastic waste such as soil and water pollution further endanger animal health and compromise food safety. There are several strategies to combat the problem of plastic pollution, including recycling, raising public awareness and adopting biodegradable alternatives. A multidisciplinary and policy-driven approach is essential to protect animal welfare, ensure food safety and promote sustainable agricultural systems.

Keywords: *Biodegradable, food safety, livestock health, polythene pollution, plastic ingestion*

INTRODUCTION
Animal production is central to global food security and economic resilience, supplying essential products such as meat, milk, eggs, hides and manure. Rising global demand for animal-based products has been driven by multiple socio-economic factors including rapid population growth, urbanisation, increased income levels and greater awareness of nutritional needs (Delgado *et al*., 2001; FAO, 2020). In response, both intensive and extensive livestock systems have expanded, particularly in developing regions where smallholder farmers commonly adopt free-range practices to minimise feeding costs (Kryger *et al*, 2010).

However, extensive grazing systems inadvertently increase livestock exposure to environmental contaminants, most notably plastic waste. Polythene, a widely used plastic in packaging and transport, is especially problematic due to its durability and improper disposal across rural and urban landscapes (Evode *et al*., 2021). When foraging, farm animals frequently ingest polythene fragments mistaken for food, leading to severe digestive disorders, malnutrition, intestinal blockage, reduced productivity and mortality (Priyanka and Dey, 2018; Babu *et al*., 2018). Post-mortem examinations in countries such as Kenya, Nigeria and Tanzania have revealed significant quantities of polythene in the rumens of slaughtered livestock, including up to 30% of goats (Aju *et al*., 2014).

The problem extends beyond direct animal health impacts. Degraded plastic waste releases

microplastics and toxic chemicals, including phthalates and bisphenol A (BPA), which bioaccumulate in animal tissues and enter the human food chain, posing significant food safety risks (Sharma *et al*., 2019). In addition, plastic waste compromises soil fertility, clogs water bodies and fosters the spread of harmful insects and pathogens (Sinha *et al*., 2018; Sajjad *et al*., 2022).

Despite its growing relevance, the polythene menace in animal production has received limited attention in environmental and agricultural policy frameworks. This review synthesises current evidence on the impacts of polythene waste in livestock systems, examines its implications for animal welfare and public health and discusses viable strategies to mitigate its effects. A multidisciplinary and policy-driven approach is essential to address this overlooked threat and ensure sustainable animal production.

DRIVERS OF POLYTHENE EXPOSURE IN ANIMAL PRODUCTION

The increasing incidence of polythene ingestion among farm animals is closely linked to socioeconomic changes influencing agricultural practices, waste management deficiencies and evolving dietary demands. Some of the factors that expose animals to the risk of consuming polythene products will now be discussed.

Rising Demand for Animal Products

Global population growth, projected to reach 9.7 billion by 2050, has substantially increased the demand for animal-source foods to meet rising nutritional needs (FAO, 2020; United Nations, 2023). Urbanisation and rising income levels have further altered dietary patterns, especially in developing countries, where animal products are now seen as indicators of improved socioeconomic status and nutritional adequacy (Delgado *et al*., 2001; Magano, Tuorila and De Kock, 2023). Health consciousness and nutritional education have also driven consumers to prioritise animal protein for its essential amino acids, vitamins and minerals (Egg *et al*., 2020).

Shift Toward Extensive and Low-Input Farming Systems

The new trend in animal husbandry in response to issues surrounding animal welfare, is the shift towards extensive production systems. Besides, many smallholder farmers have adopted extensive or semi-intensive livestock systems due to financial constraints and limited access to formulated feed. These systems often rely on free-grazing, where animals forage unsupervised in open fields, roadsides and refuse dumps frequently contaminated with plastic waste (Craft and Pitt, 2023). Inadequate feed supplementation further compels animals to consume non-nutritive substances such as polythene and other plastics mistaken for food (Evode *et al*., 2021).

Ineffective Waste Management Infrastructure

In many low- and middle-income countries, poor municipal waste collection, absence of segregation practices and indiscriminate dumping have led to the proliferation of plastic waste in agricultural zones (Jambeck *et al*., 2015; Moore, 2023). Rural and peri-urban communities often lack the infrastructure or public education needed to safely manage plastic disposal. As a result, grazing livestock are routinely exposed to hazardous materials during feeding, especially near market centres, drainage systems and refuse sites (Avtar *et al*., 2021).

Chemical Attractants and Inadvertent Ingestion

Polythene waste often contains residues of food or chemicals, which can attract animals through smell or visual cues. Livestock, especially ruminants such as cattle and goats, may repeatedly ingest these materials due to learned behaviour or the persistent presence of waste in their foraging environment (Ochieng *et al*., 2017; Babu *et al*., 2018). This not only results in mechanical damage to the digestive tract but also increases the risk of chemical exposure.

EFFECT OF POLYTHENE ON ANIMAL HEALTH

The ingestion and environmental exposure to polythene present significant threats to animal health, productivity and welfare. As plastic use and improper disposal intensify, livestock are increasingly affected by both the physical presence of polythene and the toxic substances it releases. Let us discuss some of the effects of exposing animals to polythene products.

Gastrointestinal Complications and Mortality

Polythene ingestion is especially prevalent among ruminants such as cattle, goats and sheep, which often consume plastic bags and packaging materials while foraging in contaminated areas (Avtar *et al*., 2021; Aju *et al*., 2014). These indigestible materials accumulate in the rumen and reticulum, leading to conditions such as ruminal impaction, chronic constipation, reduced feed intake and eventual death if untreated (Priyanka and Dey, 2018). Studies have shown that up to 30% of goats slaughtered in some Kenyan abattoirs had polythene residues in their stomachs (Otsyina *et al*., 2014).

Digestive obstruction impairs nutrient absorption and metabolism, reducing weight gain, fertility and milk yield (Babu *et al*., 2018). Chronic inflammation resulting from plastic fragments may also predispose animals to secondary bacterial infections and metabolic disorders (Khan *et al*., 2020).

Exposure to Microplastics and Toxic Compounds

As polythene degrades, it releases microplastics and leaches hazardous chemicals such as phthalates, bisphenol A (BPA) and heavy metals. These compounds can disrupt endocrine function, damage vital organs and compromise immune responses (Ziani *et al*., 2023). Ingested microplastics have been shown to impair reproductive health in poultry and marine organisms, reduce egg production and interfere with embryonic development (Urli *et al*., 2023).

Moreover, the accumulation of these toxicants in animal tissues increases the risk of bioaccumulation in the human food chain, raising concerns over food safety and public health (Sharma *et al*., 2019).

Physical Injuries and Reduced Mobility

In addition to ingestion, animals may become entangled in discarded polythene bags, ropes and other plastic waste. This can lead to restricted movement, injuries and in severe cases, limb amputation or death (Anunobi, 2022). The problem is not restricted to marine life; terrestrial livestock and wildlife in rural farming areas also suffer from entanglement-related trauma, particularly in unmanaged dump sites and flood-prone regions.

Water Contamination and Indirect Health Effects

Plastic waste in drainage systems and water bodies contributes to contamination of drinking sources used by livestock. Polluted water often contains harmful residues from degraded plastics, increasing the risk of chemical ingestion and waterborne diseases (Sinha *et al*., 2018; Sajjad *et al*., 2022). Since animals cannot differentiate between clean and polluted water, their exposure to microplastic-laden or chemically tainted water is often continuous and unnoticed.

MITIGATION STRATEGIES AND SOLUTIONS

Improved Waste Management Systems

The most immediate and effective solution is the proper collection, segregation and disposal of plastic waste, especially in rural and peri-urban areas where livestock frequently forage. Expanding municipal solid waste management infrastructure and investing in decentralised community-based waste sorting and recycling centres can significantly reduce environmental plastic exposure (Ilyas *et al*., 2018). Enforcement of anti-dumping regulations near grazing areas and water bodies should be prioritised.

Ghana, for instance, has seen progress through companies such as Zoomlion Ghana Limited, Jekora Ventures and the Ghana Recycling Initiative by Private Enterprises (GRIPE), which are pioneering local plastic recycling and public education initiatives.

Promotion of Biodegradable Alternatives

Replacing conventional plastics with biodegradable materials is an essential long-term intervention. Bioplastics such as polylactic acid (PLA), polyhydroxyalkanoates (PHA) and starch-based polymers degrade more readily in the environment and present lower risks to animals and ecosystems (Senila *et al.*, 2024). Though, currently more expensive, their adoption can be incentivised through policy subsidies, research investment and public-private partnerships.

Public Education and Farmer Training

Public ignorance and misinformation remain major barriers to effective plastic control. Structured educational campaigns aimed at farmers, market vendors and local waste handlers are crucial. Training should focus on the dangers of polythene ingestion in animals, the importance of clean grazing environments and best practices for disposing of plastic waste (Priyanka and Dey, 2018; López and Lázaro, 2019). Extension services and veterinary networks can serve as delivery mechanisms for such education, especially in remote areas.

Policy and Regulatory Interventions

Strong legislation and regulatory enforcement are fundamental. Governments should establish clear restrictions on single-use plastics, impose penalties for improper disposal and mandate the use of safer alternatives in agriculture-related packaging and feed handling (Rochman *et al*., 2013; UNEP, 2021). The recent talk of banning the use of single-use plastics by the government of Ghana is a refreshing piece of news. We hope it will not just end at the usual talk level but see implementation as soon as possible. Livestock-related policies must integrate environmental risk assessments that include plastic exposure metrics.

Research and Innovation

Research is focused on creating biodegradable polymers and materials that can replace conventional polythene used in agriculture and animal production. These alternatives degrade more rapidly in the environment, reducing long-term pollution and risks to animals (Maina, 2012). Further research is needed to develop cost-effective, scalable plastic alternatives, understand the toxicokinetics of plastic-related contaminants in animals and improve detection methods for microplastics in food systems. Innovations include better collection, segregation, and recycling systems for plastic waste in agricultural settings. Applying the 4Rs (Reduce, Reuse, Recover, Recycle) helps manage plastic waste effectively, preventing it from entering animal habitats and digestive systems (Priyanka and Dey, 2018). Innovation in bioremediation, plastic-eating enzymes and animal-safe waste disposal systems could transform the way plastic is managed in agricultural settings (Rai *et al*., 2020; Kumar *et al*., 2021).

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