Current knowledge and research gaps for manure management in sub-Saharan Africa

Tropentag 2026, Göttingen


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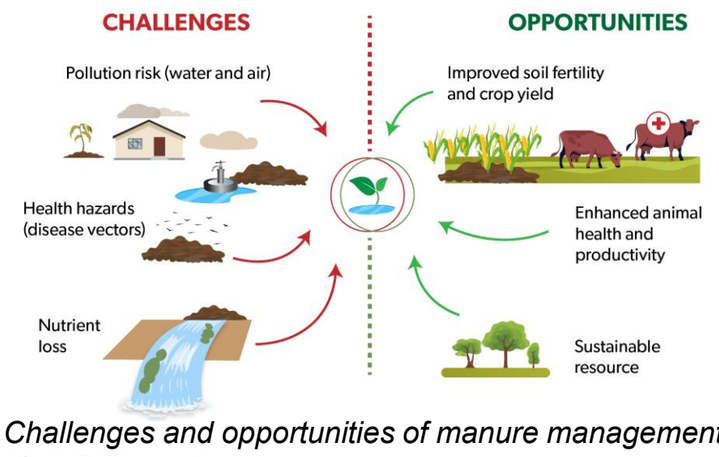
Background

Livestock manure is a critical nutrient resource in sub-Saharan Africa (SSA), but poor management causes environmental problems and health risks.



Challenges and opportunities of manure management. (© ILRI/the authors)

Livestock production in SSA is rapidly increasing, and with that the volume of manure is rising, but there are no clear guidelines and policies for its management, as evidence is scattered and does not link production, environmental, and social outcomes.

This systematic literature review focuses on **manure management practices** in **extensive** and **mixed livestock systems in SSA**, with special emphasis on nutrient circularity and emissions of CH_4, N_2O, and NH_3 across the entire manure management chain, from housing and collection to storage and field application.

Housing → Collection → Storage → Application

Key findings

Nutrient balances and productivity

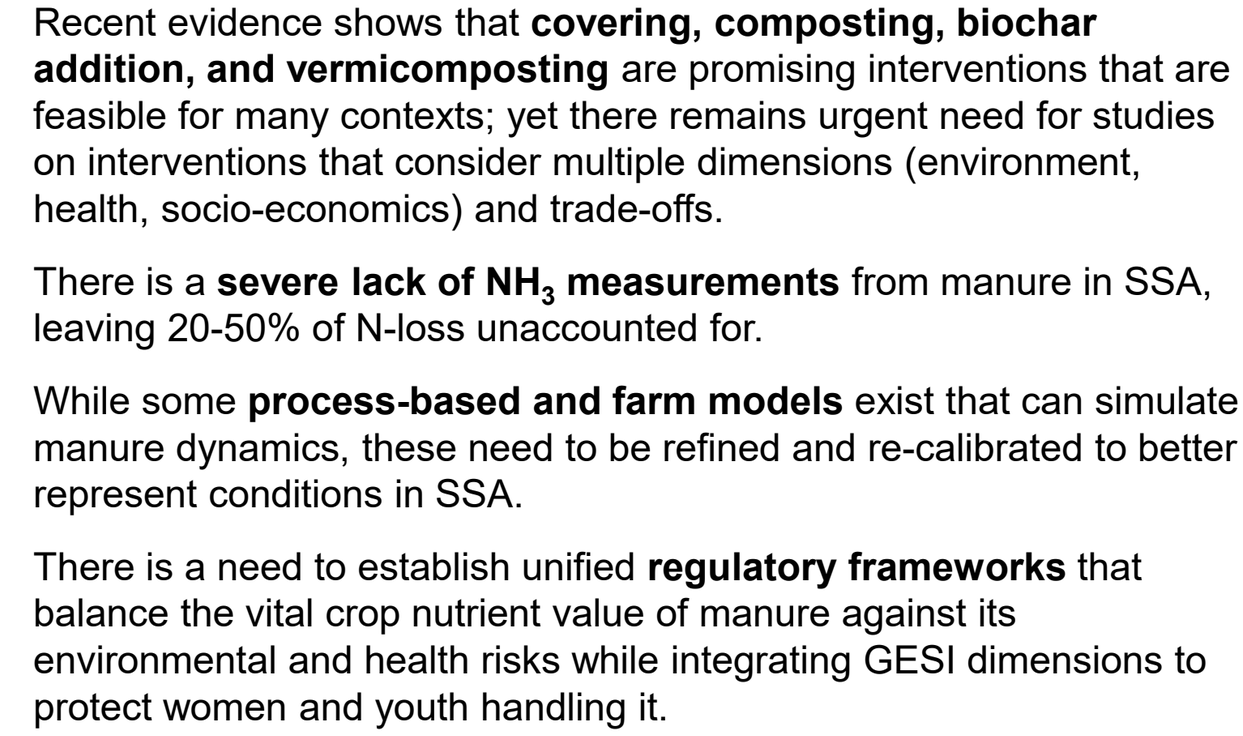
- 20-50% of **manure-N is lost before reaching croplands** due to unlined earthen floors, lack of urine capture, and open storage.
- Manure application rates (~16 kg N ha^{-1}) **fail to balance typical crop harvest nutrient removals** (~50 kg N ha^{-1}) or meet fertilizer recommendations (~100 kg N ha^{-1}).

Emissions & biogeochemical hotspots

- While **manure N_2O emissions** from grazing livestock **are often lower** than IPCC Tier-1 values due to low-N diets, results on manure CH_4 are ambiguous and require more attention.
- Overnight **livestock corrals (bomas)** account for up to 32% of landscape-scale **N_2O emissions** that are **not considered in IPCC** inventories.

Health & GESI dimension

- Animal **manure carries pathogens** and is a reservoir for **antimicrobial resistance (AMR)**. Few studies and guidelines consider this and public awareness is low.
- **Women and children** perform most of the manure-related labor such as manure clearing, transport, and application. However, livestock ownership, land tenure, and marketing revenue remain largely controlled by men.



Manure flows across the landscape and sources of emissions and environmental risks in mixed and pastoral systems. (© ILRI/the authors)

Common practices across SSA: (A) open, uncovered manure heap next to animal housing; (B) open animal housing without a continuous roof and on earthen floor; (C) open boma (corral) where manure accumulates (© ILRI/Sonja Leitner).

Research gaps and recommendations

- Recent evidence shows that **covering, composting, biochar addition, and vermicomposting** are promising interventions that are feasible for many contexts; yet there remains urgent need for studies on interventions that consider multiple dimensions (environment, health, socio-economics) and trade-offs.
- There is a **severe lack of NH_3 measurements** from manure in SSA, leaving 20-50% of N-loss unaccounted for.
- While some **process-based and farm models** exist that can simulate manure dynamics, these need to be refined and re-calibrated to better represent conditions in SSA.
- There is a need to establish unified **regulatory frameworks** that balance the vital crop nutrient value of manure against its environmental and health risks while integrating GESI dimensions to protect women and youth handling it.

Methodology

We conducted a literature search on publications between 2000-2025, including peer-reviewed articles and grey literature, using the PICO framework (Population, Intervention, Comparison, Outcome). *Population* included livestock systems, SSA, mixed system, and pastoralism. *Interventions* considered all forms of manure collection, handling, storage, treatment, and field application. *Comparisons* were made with traditional/ baseline practices. *Outcomes* of interest included environmental impacts, nutrient cycling and fertilizer efficiency, and socio-institutional dimensions. After checks, 102 publications were considered.

Acknowledgements

BOKU UNIVERSITY · ILRI · Mazingira Centre · Agroscope · Swiss National Science Foundation · Solution-oriented Research for Development Programme · CGIAR SUSTAINABLE ANIMAL AND AQUATIC FOODS · CGIAR CLIMATE ACTION