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Evaluating manure management interventions for fertiliser quality and zoonotic pathogens in pig manure, Uganda



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Introduction

The **pig sector in Uganda** has more than doubled from 3.2 to 7.1 million animals between 2008 and 2021 (UBOS, 2024), resulting in a corresponding increase in manure volumes.

Based on **how this manure is managed**, this presents both significant environmental risks and opportunities for smallholder farmers. **Liquid-solid separation, composting and biochar addition** have been recognized as potential management options but **have never been field-tested in Uganda**.

❖ This study evaluated the **effectiveness of low-cost manure management interventions** in enhancing **fertiliser quality**, mitigating **nutrient losses**, and reducing **zoonotic pathogen occurrence in pig manure in Uganda**.

Methodology

On-farm composting experiments were conducted at R&A Finest Farm in Buikwe District, Uganda. Solid and liquid manure fractions were collected from animal housing with concrete flooring and roofs and were managed separately.

- The **solid fraction** (dung + bedding) was composted in open heaps (85 days) under **covered & turned (CT)**, **covered, turned & biochar addition (CTB)** and **uncovered & unturned (UCT)** conditions.
- The **liquid fraction** (urine + flush water) was stored in containers (6 weeks) under **covered (CL)** and **uncovered (UL)** conditions.



Fig 1: Solid and liquid manure treatments; a. heap covered with banana leaves, b. turning process, c. uncovered heap, d. covered and uncovered liquid manure containers.

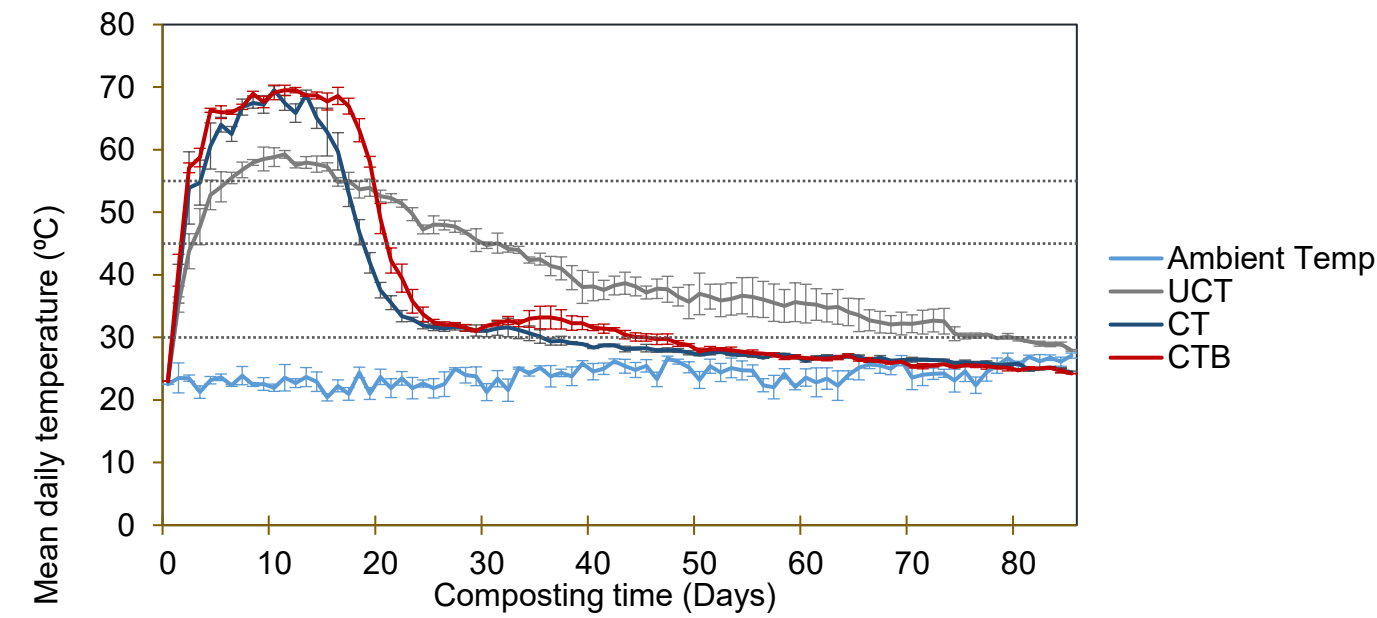
➤ Samples were collected to measure chemical composition (dry matter, pH, organic carbon, total nitrogen, ammonium, nitrate, extractable phosphorus, and potassium), germination index, and pathogen species (*Salmonella*, *Enterococci* and *E. coli*).

Conclusions

- Composting with covering and biochar addition improved fertiliser quality and biosafety of pig manure under real-world conditions, and therefore represent a feasible, low-cost option for smallholder pig farmers to increase productivity and farm health.
- More on-farm studies such as this are urgently needed to translate lab findings into actionable recommendations for farmers and decision makers.

Results

Temperature dynamics during composting



Temperature profiles of pig manure compost heaps show a clear **thermophilic window in the first three weeks** which is **increased by the management interventions (CT + CTB)**.

Maturity of the compost

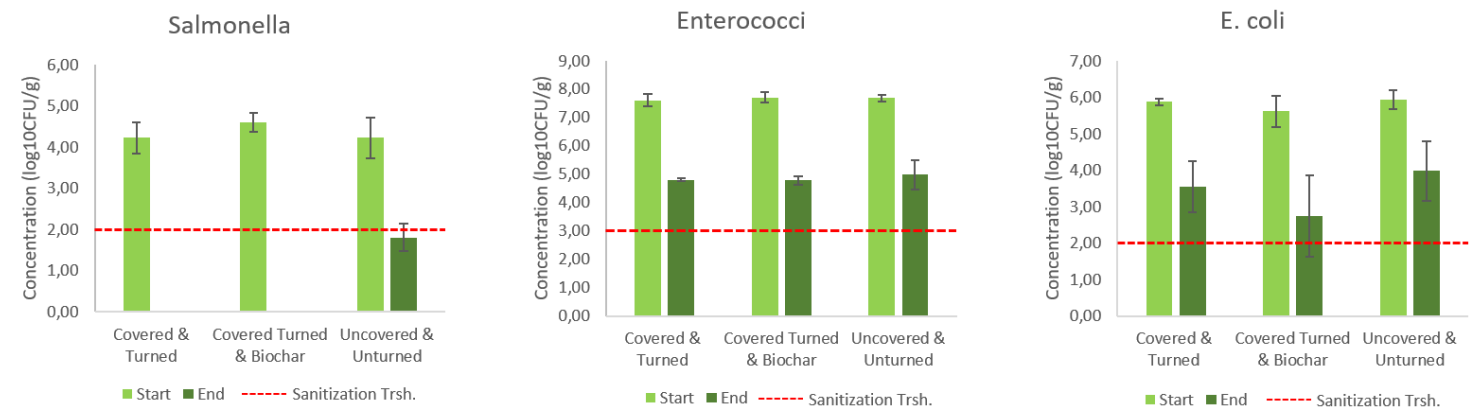
While C:N and GI were similar, the ammonium:nitrate ratio showed **improved fertilizer quality of composted manure** than to the unturned control.

	Covered + turned	Covered + turned + biochar	Uncovered unturned	P-value
C:N ratio	14.4 ± 2.3 ^a	13.5 ± 1.8 ^{ab}	12.0 ± 1.4 ^b	0.048
GI (%)	52.0 ± 9.5	50.0 ± 7.9	56.7 ± 3.2	0.559
NH ₄ ⁺ -N:NO ₃ ⁻ -N	1.04 ± 0.42 ^a	0.96 ± 0.02 ^a	2.15 ± 0.73 ^b	0.031

GI = Germination Index

Manure sanitization

Pathogen reduction in solid manure



Pathogen reduction in liquid manure



There was a decline in pathogenic indicator species over time in solid and liquid manure in all treatments. The **tested manure management interventions reduced some pathogens more effectively** than the control treatments. Nevertheless, the use of protective clothing and equipment as well as regular disinfection of all tools is strongly recommended in all cases.

Acknowledgements

