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Agroecological, Socioeconomic Potentials and Limitations of Abandoned Cattle Corrals in Sub-saharan Africa: A Review

Nguza Siyambango-Mulisa[1], Simon Kamwele Awala[2], Rhoda Birech[2]

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ABSTRACT

Abandoned livestock corrals are widespread, yet overlooked legacies of pastoral and mixed crop–livestock systems in sub Saharan Africa. This review synthesizes their agroecological and socioeconomic potentials and limitations relative to surrounding landscapes. Agroecologically, former corrals typically show elevated soil organic carbon, nitrogen, phosphorus, cation exchange capacity, boosting fertility, crop productivity and low input options that reduce mineral fertilizer dependence. They can also create biodiversity hotspots via distinctive vegetation succession and aid forest regeneration on degraded land. Key limitations include spatial fragmentation, nutrient losses (especially leaching), invasive species risks and limited scalability due to heterogeneous distribution. Utilization is further constrained by insecure tenure, space competition, labor intensive rehabilitation and farmer–pastoralist conflicts. Abandoned corrals are underutilized resources for sustainable intensification in sub-Saharan Africa. Realizing their full potential requires integrated management strategies that address ecological trade-offs, socioeconomic barriers and context-specific governance frameworks.

Key words: Abandoned corrals, Crop production, Land tenure, Livestock, Soil fertility.

In sub Saharan Africa, cattle are commonly enclosed overnight in temporary or semi-permanent structures made of thornbush, poles, or stones-variously termed “corrals”, “bomas”, “pens” or “kraals”-to protect animals, facilitate husbandry and manage grazing (Riginos *et al.*, 2012; Porensky and Veblen, 2015). Farmers often place the corrals near homesteads for easier monitoring, protection from theft or predation and management of water and feed resources. However, kraal abandonment has surged lately driven by a blend of socioeconomic, environmental and institutional changes (Sibanda *et al.*, 2016; Muvengwi *et al.*, 2018; Huruba *et al.*, 2018). As herds move or households relocate, these enclosures are periodically abandoned, resulting in a mosaic of former kraal sites embedded in a savanna landscape. These sites concentrate years of dung, urine and trampling, creating distinct biogeochemical and ecological legacies that can persist for decades (Kizza *et al.*, 2010; Vinograd and Kigel, 2020; Butterbach-Bahl *et al.*, 2020).

Growing pressures to intensify sustainably, reduce fertilizer dependence and restore degraded lands have brought renewed attention to the agroecological and socioeconomic potentials of such abandoned kraals, alongside their limitations and risks (Huruba *et al.*, 2022; Momberg *et al.*, 2023). Abandoned corral sites have become a notable feature in sub-Saharan Africa, drawing attention for their unique biogeochemical legacy. From an agroecological perspective, abandoned kraals are well-documented nutrient hotspots (Kizza *et al.*, 2010; Porensky and Veblen, 2015; Edwards *et al.*, 2022; Momberg *et al.*, 2023). Empirical evidence suggests that abandoned kraal sites can remain fertile for several decades after the kraals are abandoned (Kizza *et al.*, 2010; Muvengwi *et al.*, 2018).

[1]Multi-Disciplinary Research Services, University of Namibia, 340 Mandume Ndemufayo Avenue, P Bag 13301, Pionierspark, Windhoek, Namibia.
[2]School of Agriculture and Fisheries Sciences, Faculty of Agriculture, Engineering and Natural Resources, University of Namibia, Private Bag 13388, Windhoek 9000, Namibia.

Corresponding Author: Nguza Siyambango-Mulisa, Multi-Disciplinary Research Services, University of Namibia, 340 Mandume Ndemufayo Avenue, P Bag 13301, Pionierspark, Windhoek, Namibia. Email: nmulisa@unam.na

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The duration of these effects can vary depending on environmental factors such as rainfall and temperature, as well as the soil type. In drier sites, the decomposition rate is slower and the effects of the organic matter can persist for longer periods (Kizza *et al.*, 2010). These sites have potential to accelerate tree establishment or fodder bank development when integrated into agroforestry or restoration plantings. However, their potential in enhancing local agricultural productivity and advancing sustainable land-use practices remains largely untapped in formal land use planning.

Repurposing kraals provides an affordable way to increase crop yields, cut reliance on synthetic fertilizers and improve food security, benefiting resource-poor smallholder farmers (Muhereza *et al.*, 2014). Their transformation into croplands or community gardens can generate income, empower marginalized groups and strengthen climate resilience. However, persistent challenges include soil compaction, invasive weeds, nutrient imbalances and contamination risks from livestock waste (Kizza *et al*., 2010; Sibanda *et al*., 2016). Socioeconomic barriers such as unclear land tenure, limited access to inputs/markets and insufficient extension services further hinder adoption. Most existing research emphasizes the effects of kraal abandonment on soil fertility and grass biomass, while neglecting the potential for crop cultivation (Kizza *et al*., 2010; Muvengwi *et al*., 2018; Huruba *et al*., 2022; Momberg *et al*., 2023). Former kraal sites likely have nutrient-rich soils that can support various crops, but research on specific crop types suitable for these sites and their performance in sub-Saharan Africa is limited (Momberg *et al*., 2023). The major objective of this review is to synthesize current knowledge on the agroecological and socioeconomic potentials and limitations of abandoned cattle kraals in sub-Saharan Africa. Specifically, this review aims to (i) evaluate how kraal legacies alter soil properties and the implications for crop and forage production; (ii) analyze socioeconomic factors that mediate adoption; and (iii) identify management options and policy levers that can amplify benefits while mitigating risks. This review bridges agroecology and social science to guide practitioners, policymakers and communities in transforming former livestock enclosures into a resource for sustainable and equitable land use. Fig 1 presents a conceptual framework that shapes the narrative of this review. This figure illustrates the intricate agroecological and socioeconomic dynamics associated with abandoned cattle corrals in sub-Saharan Africa.

Drivers of corral abandonment in sub-saharan Africa

Several factors contribute to the abandonment of cattle corrals in sub-Saharan Africa (Fig 2). The accumulation of livestock dung can create unsanitary conditions, characterized by foul odors, increased pest infestation and heightened risks of disease transmission (Moyo and Ravhuhali, 2022; Mthiyane *et al*., 2022; Fischer *et al*., 2024). Rural-urban migration leads to the discontinuation of traditional livestock management practices, resulting in the neglect of formerly active corral sites (Moyo and Ravhuhali, 2022). Younger generations may have less interest in undertaking traditional agro-pastoral practices, opting instead for wage labor or non-agricultural sources of income (Mthiyane *et al*., 2022; Fischer *et al*., 2024). Increasing and more intense droughts diminish the availability of grazing and water resources, making livestock production less feasible and forcing pastoralists to destock or migrate seasonally (Munyati, 2025). Conflicts over land tenure and access can significantly contribute to corral abandonment, particularly in areas with poorly defined property rights or contested land ownership (Drew and Knutsson, 2025).

Agroecological potentials: enhancing soil and ecosystem health

Soil fertility hotspots: Nutrient enrichment and organic matter

Abandoned livestock corrals are powerful drivers of landscape heterogeneity in African ecosystems. Table 1 shows the minimum and maximum values of soil parameters measured in former kraal sites and the surrounding matrix. This table shows that cattle kraaling approximately doubled the soil concentrations of organic

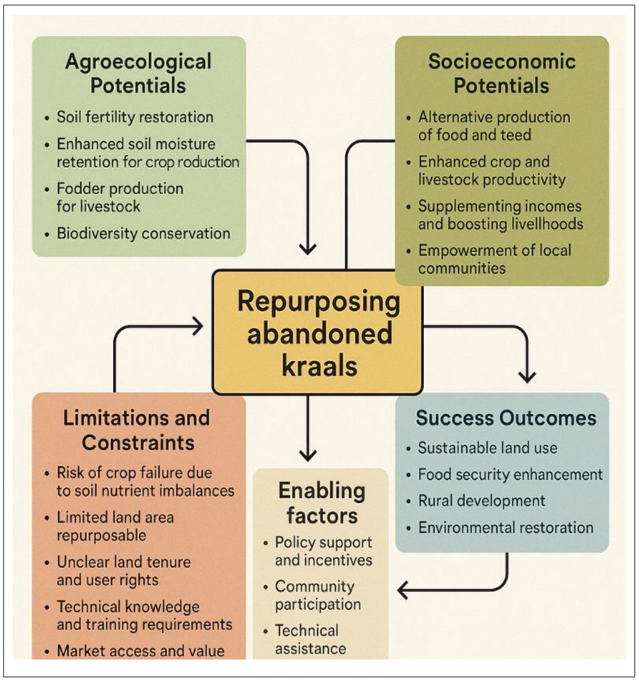

Fig 1: Conceptual framework for repurposing abandoned livestock kraals.

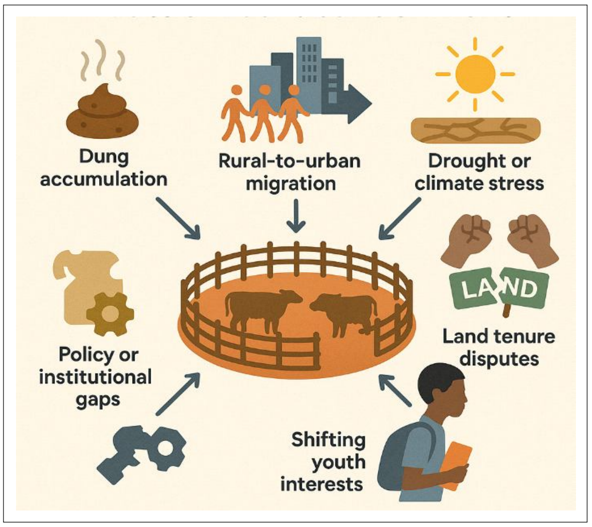

Fig 2: Major drivers of cattle corral abandonment in sub-saharan Africa.

carbon (C). The high input of organic matter from dung leads to a substantial increase in soil organic C, which in turn significantly improves soil physical properties (Xu *et al*., 2024). These improvements-enhanced water infiltration, retention and soil structure-are critical in arid and semi-arid regions of sub-Saharan Africa, where water scarcity often limits crop production (Omokpariola *et al*., 2025). Phosphorus, a key limiting nutrient in many African savannas, is more than fivefold greater in abandoned corral sites than in the surrounding matrix (Table 1).

In several studies, abandoned corral sites had more than double the nitrogen (N) and potassium (K) levels of the surrounding area (Stelfox, 1986; Kizza *et al*., 2010; van der Waal *et al*., 2011; Chikorowondo *et al*., 2017). Specifically, P tends to be less mobile and shows long-term persistence, while N and K may decline more rapidly over time (Hawkins *et al*., 2022). It is important to note that direct comparison of absolute values between studies can be challenging due to variations in analytical methods, soil types and the age of the abandoned corrals. While variability exists between sites-driven by factors such as corral age, environmental conditions and management history-there is a consensus that this legacy effect can persist for decades post-abandonment (Kizza *et al*., 2010; van der Waal *et al*., 2011; Porensky and Veblen, 2015; Butterbach-Bahl *et al*., 2020). Soil calcium (Ca) and magnesium (Mg) also exhibit greater concentrations in former corral sites than in the surrounding matrix (Table 1).

Studies on short-duration overnight kraaling conducted in African savanna rangelands showed that kraaling can be intentionally employed to create nutrient hotspots, effectively rehabilitating degraded rangelands (Huruba *et al*., 2018; Huruba *et al*., 2022). Former corral sites exhibit slightly higher pH levels, which can improve nutrient availability and reduce soil acidity (Momberg *et al*., 2023). The texture of kraaled soils is generally similar to surrounding areas, but the structure may be altered due to compaction from livestock trampling. This can affect water infiltration and root penetration (Augustine *et al*., 2003).

Improved crop performance and yields

There is a scarcity of comprehensive studies focusing on crop production in abandoned livestock kraals in sub-Saharan Africa. However, a recent study in South Africa's Vhembe district by Kom *et al*. (2024) found that farmers are increasingly planting crops in abandoned corrals due to their higher crop yields compared to less enriched fields. The high concentrations of essential nutrients and improved soil physical properties create favorable conditions for plant growth, making these sites attractive for smallholder cultivation and land restoration efforts. Improved soil structure and water retention, as observed in multiple studies (Veblen, 2012; Chikorowondo *et al*., 2017), promote higher crop yields and increased forage biomass. This is especially beneficial for resource-constrained smallholders who may not have access to synthetic inputs. A study by Huruba *et al*. (2022) found that

Table 1: Soil metrics reported in abandoned cattle corrals (1-45 years since abandonment) and surrounding sites in sub-saharan Africa.

Parameter	Unit	Abandoned corrals sites	Surrounding sites	Location	References
OC	%	1.1-5.0	0.7-3.24	Kenya; Botswana; Zimbabwe	Stelfox, 1986; Kizza *et al*., 2010; Porensky and Veblen, 2015; Chikorowondo *et al*., 2017
N	%	0.2-0.4	0.1-0.2	Botswana; South Africa Zimbabwe	Kizza *et al*., 2010; Waal *et al*., 2011; Chikorowondo *et al*., 2017
NH_4-N	mg kg^{-1}	99-114	99	Botswana	Kizza *et al*., 2010
NO_3-N	mg kg^{-1}	99-120	100	Botswana	Kizza *et al*., 2010
P	ppm	42-230	10.5-29.8	South Africa, Zimbabwe	van der Waal *et al*., 2011; Chikorowondo *et al*., 2017
K	meq/100 g	0.9-7.1	0.34-1.30	Botswana; South Africa; Zimbabwe	Kizza *et al*., 2010; van der Waal *et al*., 2011; Chikorowondo *et al*., 2017
Ca	meq/100 g	2.1-7.5	1.58-3.0	Botswana; South Africa	Kizza *et al*., 2010; van der Waal *et al*., 2011; Chikorowondo *et al*., 2017
Mg	meq/100 g	1.2-2.4	0.9-1.03	Botswana; South Africa	Kizza *et al*., 2010; van der Waal *et al*., 2011; Chikorowondo *et al*., 2017
Na	meq/100 g	0.2-0.3	0.20-0.23	Zimbabwe; South Africa	Chikorowondo *et al*., 2017; van der Waal *et al*., 2011
CEC	meq/100 g	3.6-3.8	2.4	Botswana	Kizza *et al*., 2010
pH	$CaCl_2$	5.3-7.4	4.7-5.3	Zimbabwe; Botswana	Kizza *et al*. 2010; Chikorowondo *et al*., 2017
Sand	%	70–74	75.8	Botswana	Kizza *et al*., 2010
Silt	%	14-20	13.4	Botswana	Kizza *et al*., 2010
Clay	%	9-14	10.8	Botswana	Kizza *et al*., 2010

short-duration overnight cattle corrals enhanced grass nutrient content compared to surrounding areas, suggesting potential for producing high-quality fodder crops in abandoned corrals. Crops grown in abandoned corrals have access to a readily available supply of critical nutrients, reducing the need for external fertilizer inputs, which are often expensive and inaccessible for smallholder farmers. The improved soil moisture retention in abandoned corral sites allows crops to better withstand dry spells and utilize available rainfall more efficiently, a vital advantage in rain-fed agricultural systems. Nonetheless, gradual nutrient decline necessitates adaptive fertility management to maintain long-term soil health. Strategies such as intercropping, cover cropping and organic supplementation can be used to extend the productive lifespan of these sites (Chitara *et al*., 2024).

Enhancing biodiversity and ecosystem services

Multiple studies confirm that grasses growing in abandoned kraals show elevated foliar nutrient concentrations (N, P and K) and base cations compared to grasses growing in surrounding sites (Table 2) (ranges reflect minimum and maximum values reported across studies). Following abandonment, corrals typically experience a surge in herbaceous productivity, often producing up to twice the biomass of adjacent savanna areas (Table 2). This productivity shift drives changes in plant community structure. Although overall species richness may remain comparable to control plots, the composition of the plant community is markedly altered (Muchiru *et al*., 2009; Porensky and Young, 2013). These sites are characterized by increased herbaceous cover, reduced woody plant density and a dominance of nutrient-demanding grasses and forbs, forming lush vegetation patches that contrast sharply with the nutrient-poor surrounding bushland (Young *et al*., 1995; Muchiru *et al*., 2009; Porensky and Young, 2013).

During early to mid-successional stages, former corral sites support distinct herbaceous assemblages with higher forb abundance and reduced woody encroachment (Muchiru *et al*., 2009; Porensky and Young, 2013). The palatability and nutritional value of forage in these sites attract herbivores, increasing visitation rates and residence times. Herbivore activity also contributes to seed dispersal and modifies plant community dynamics through trampling and selective foraging. Elevated seed and insect availability in former corral sites can enhance small-mammal activity and attract granivorous and insectivorous birds. Additionally, enriched floral resources and soil nutrients promote higher pollinator visitation and detritivore activity (Veblen *et al*., 2016).

The combination of increased plant biomass and altered soil conditions creates a favorable microhabitat for macro-invertebrates. In a semi-arid Zimbabwean savanna, Chikorowondo *et al*. (2018) found that both aboveground and belowground macro-invertebrate species richness were significantly higher in abandoned kraals compared to surrounding savanna plots. Notably, belowground invertebrate diversity was substantially elevated, highlighting the long-term ecological influence of these nutrient hotspots.

socio-economic potentials: Supporting rural livelihoods

Repurposing abandoned corrals offers numerous benefits for smallholder farmers, rural development and sustainable agriculture. It reduces the need for synthetic fertilizers, lowering input costs for resource-constrained smallholders (Zingore *et al*., 2007; Mekuria and Veldkamp, 2011). Abandoned corral sites provide a natural source of nutrients, minimizing the reliance on external inputs (Zingore *et al*., 2007). This cost-effective approach to soil fertility management enables farmers to maximize returns on small parcels of land. The improved soil structure and increased water-holding capacity of former corral sites enhance drought tolerance and flood damage (Seitz *et al*., 2018). Healthy soils with high organic matter content can better absorb heavy rainfall events, reducing surface runoff and soil erosion (Mahmood *et al*., 2023). During droughts,

Table 2: Grass metrics reported in abandoned cattle kraal and surrounding (control) sites in sub-saharan Africa (1-45 years since abandonment).

Parameter	Unit	Abandoned kraal sites	Surrounding sites	Location	References
N	%	0.56-2.5	0.34-1.2	Zimbabwe; South Africa;	van der Waal *et al*., 2011;
P	%	0.18-0.45	0.10-0.22	Kenya	Sibanda *et al*., 2016;
K	%	0.35-3.0	0.4-1.5		Huruba *et al*., 2018;
Ca	%	0.05-1.51	0.05-0.9		Chikorowondo *et al*., 2017;
Mg	%	0.07-0.6	0.11-0.4		Muchiru *et al*., 2009
NDF	g kg^{-1}	700-766	760		
ADF	g kg^{-1}	500-526	528		
Digestibility	%	41.9-49.6	41.5		
Biomass	kg ha^{-1}	781-37500	928-7500		
Species richness		4-6	3.0	Zimbabwe	Sibanda *et al*., 2016
Species diversity		1.0	1-1.5	Zimbabwe	Sibanda *et al*., 2016; Huruba *et al*., 2018

the increased water retention acts as a buffer, prolonging crop survival and maximizing the benefits of limited rainfall events.

Repurposing abandoned corrals can reduce pressure to clear new land for cultivation, promoting sustainable land management and conserving surrounding ecosystems (Byerlee *et al*., 2014). By utilizing these existing sites, farmers can minimize deforestation, preserve biodiversity and maintain ecosystem services. The transformation of abandoned corrals into productive land uses, such as vegetable gardens or tree nurseries, can create employment opportunities for youth and women (Nzama and Ntini, 2022). Community-based cooperatives can be formed around these sites to collectively manage inputs, production and marketing, stimulating microenterprise growth and enhancing household incomes. Abandoned corrals can be converted into household gardens, enhancing access to fresh vegetables and legumes. This diversification of diets can improve nutritional outcomes, particularly for vulnerable groups such as children, pregnant women and the elderly (Hansen *et al*., 2022). Producing food close to homesteads also reduces time and labour burdens associated with farming distant fields.

Limitations and challenges to sustainable repurposing

Biophysical and environmental constraints

The repurposing of abandoned corrals in sub-Saharan Africa is hindered by several biophysical and environmental constraints. Table 3 summarizes the constraints associated with repurposing abandoned livestock kraals, including their underlying causes, implications and the management strategies required. Prolonged cattle trampling compacts the soil, reducing its porosity and water infiltration capacity and increasing the risk of poor drainage, surface waterlogging and runoff (Zingore *et al*., 2007; Zingore *et al*., 2011). Abandoned corrals often exhibit patchy nutrient distribution, accompanied by toxic accumulations of ammonium, nitrates, or heavy metals (Hejna *et al*., 2018). This can lead to "fertility islands" that do not necessarily benefit the entire agricultural field (Tittonell *et al*., 2007). Without appropriate management, nutrient losses through leaching and volatilization can occur, reducing the environmental benefits initially intended (Butterbach-Bahl *et al*., 2020).

Corral sites are often colonized by aggressive weed species, which can outcompete crops or fodder species, requiring intensive weeding and site preparation (Moyo and Ravhuhali, 2022). Abandoned corrals can be hotspots for invasive species, which can spread rapidly and alter local ecosystems, hindering biodiversity restoration and being costly to control. Many abandoned corrals suffer from poor moisture-holding capacity, especially in sandy or shallow soils, which can limit crop productivity (Hawkins *et al*., 2022).

Due to bare ground exposure, sloped terrain and absence of vegetation cover, corral sites are prone to wind and water erosion, which can lead to nutrient loss and undermine long-term productivity (Marzen *et al*., 2019). High nutrient loading and disturbance can alter microbial communities in corral soils, affecting nutrient cycling and plant-microbe interactions essential for sustainable productivity (Chivenge *et al*., 2011). Corrals may harbor elevated concentrations of soil-borne pathogens, which can infect crops or pose zoonotic risks (Dixon and Tilston, 2010). Climatic extremes, such as prolonged droughts and intense rainfall events, can limit the success of rehabilitating abandoned corrals, particularly in semi-arid and arid zones (Trentini *et al*., 2025).

Socio-economic and institutional barriers

The repurposing of abandoned livestock corrals in sub-Saharan Africa is hindered by several socio-economic and institutional barriers. Financial limitations pose a significant challenge to the repurposing of abandoned corrals. Smallholder farmers often lack access to credit or subsidies, which are essential for investing in land preparation, fencing and high-quality seeds (Langyintuo *et al*., 2020). The high upfront costs associated with rehabilitating these sites can be a deterrent for resource-poor households (Christiaensen and Maertens, 2022). The availability and accessibility of resources are critical for the successful repurposing of abandoned corrals. However, many farmers face challenges in accessing high-quality seeds, water and implements. Furthermore, rural extension services, which provide technical guidance and support, are often underfunded and understaffed, limiting their effectiveness (Langyintuo, 2020).

Marketing challenges also hinder the repurposing of abandoned corrals. Poor road networks, lack of storage facilities and limited access to markets can discourage production beyond subsistence levels (Huruba *et al*., 2018). Additionally, market linkages for non-traditional products, such as green manure and legume fodder, are poorly developed in many rural areas. Social and cultural norms can also limit the repurposing of abandoned corrals. Customary land tenure and cultural norms often restrict women's and youths' rights to land ownership and decision-making (Adebayo *et al*., 2024). In many communities, corrals are traditionally male-dominated spaces and decision-making over their repurposing may exclude women, despite their role as primary food producers (Singirankabo and Ertsen, 2020).

Institutional barriers, including uncertainty over land tenure and lack of formal land-use planning, can also hinder the repurposing of abandoned corrals. In communal areas governed by customary law, land tenure can be uncertain, leading to disputes over land use and access. Furthermore, abandoned corrals are often overlooked in formal land-use planning and rural development programs, resulting in missed opportunities for sustainable land use and climate resilience interventions (Mdoda and Gidi, 2023).

Cognitive and behavioral limitations

Several cognitive and behavioral barriers hinder the repurposing of abandoned corrals in sub-Saharan Africa.

Table 3: Constraints, causes, implications and management strategies in repurposing abandoned livestock kraals.

Constraint	Underlying causes	Implications	Management strategies	Sources
Soil nutrient imbalance	Accumulation of dung and urine leading to high N and P but poor micronutrient balance	Risk of nutrient toxicity or deficiencies for crops; low yields	Soil testing and site-specific nutrient amendments; organic matter incorporation	Moore *et al*., 2014; Mapiye *et al*., 2021
Soil fertility decline over time	Continuous monocropping, overgrazing and poor nutrient cycling	Reduced yields, increased erosion and lower resilience to climate stress	Integrated soil fertility management, organic amendments and crop rotation	Vanlauwe *et al*., 2014
Water scarcity	Erratic rainfall, poor water harvesting and climate change	Crop failure and conflict over water resources	Rainwater harvesting, drip irrigation and agroforestry for microclimate control	Chivangulula *et al*., 2024
Soil compaction	Long-term livestock trampling and limited vegetation recovery	Reduced infiltration, aeration and root penetration	Deep tillage, ripping and cover cropping	Corbeels *et al*., 2014
Weed invasion (esp. invasive species)	Abandonment and disturbed microhabitats	Increased land clearing costs; threat to native species	Timely manual or chemical control; promotion of competitive crops	Moyo and Ravhuhali, 2022
Lack of secure land tenure	Communal land systems and unclear ownership post-abandonment	Discourages investment in rehabilitation	Community-led tenure clarity mechanisms and benefit sharing	Singirankabo and Ertsen, 2020; Mdoda and Gidi, 2023)
Knowledge gaps and low awareness	Limited extension support; weak integration of indigenous and scientific knowledge	Poor adoption of improved practices	Farmer field schools, local demonstrations, participatory extension	Mbatha, 2024
Labour and resource constraints	Household poverty; seasonal labour demands	Inability to rehabilitate or manage kraals productively	Collective action, input subsidies, small mechanization tools	Christiaensen and Maertens, 2022

Many smallholder farmers are unaware of the ecological and economic benefits of repurposing abandoned corrals, such as improved soil fertility and increased crop yields (Sithole *et al*., 2024). This lack of awareness can be attributed to limited access to information, inadequate extension services, or insufficient peer learning (Manju *et al*., 2017; Mbatha, 2024). Farmers may lack practical knowledge on rehabilitating corral soils, selecting suitable crops and managing nutrient overload, leading to poor decision-making and suboptimal land use (Zingore *et al*., 2011; Mbatha, 2024).

Corrals may hold cultural or spiritual significance, making transformation into crop fields taboo or disrespectful (Sinthumule, 2024). This cultural attachment can limit the willingness to repurpose abandoned kraals. Farmers may view abandoned kraals as “used up” or “polluted” areas unsuitable for cropping, leading to underestimation of the site’s nutrient potential and discouraging investment in rehabilitation. Farmers may perceive risks of investing in unfamiliar practices as outweighing benefits, especially when past experiments or peer experiences have failed, leading to a preference for familiar, suboptimal practices (Touch *et al*., 2024). Farmers may prefer to continue familiar practices rather than try new interventions, even if the latter offer potential benefits, limiting innovation and adoption of sustainable land use practices. Limited adoption of corral repurposing can be attributed to social norms and fear of ridicule, limiting the diffusion of innovations (Moyo and Ravhuhali, 2022).

The absence of local success stories or farmer-led demonstration plots can limit confidence in repurposing corrals, highlighting the importance of visible “proof of concept.” Younger populations may view agriculture as outdated or unprofitable, leading to disengagement from land rehabilitation and innovation around livestock waste use (Mthiyane *et al*., 2022). Women’s knowledge and perspectives may be underutilized due to exclusion from decision-making around corrals, perpetuating knowledge gaps and missed opportunities for gender-sensitive innovations (Adebayo and Worth, 2024).

Management strategies for abandoned livestock kraals

Abandoned livestock corrals in sub-Saharan Africa offer significant ecological and agricultural benefits, but their effective management is crucial to maximize these advantages while mitigating potential negative impacts. Planting high-value or nutrient-demanding crops that capitalize on the elevated soil fertility of abandoned corrals can enhance agricultural productivity. Crops such as leafy greens are well-suited for these areas. Drought-tolerant varieties can also be beneficial, given the improved water retention of kraal soils (Maseko *et al*., 2019).

Regular soil testing is essential to monitor nutrient levels and identify potential deficiencies or excesses. This information can inform targeted application of specific micronutrients or organic amendments, avoiding the blanket use of synthetic fertilizers (Kizza *et al*., 2010; Afifatul *et al*., 2024). Implementing crop rotation and intercropping can help balance nutrient removal, improve soil structure and break pest and disease cycles (Al-Musawi *et al*., 2025). Effective weed management is critical to prevent competition with desired crops and minimize the spread of invasive species to surrounding areas. Manual removal, mulching, or targeted herbicides can be employed to control weeds (Rupali and Sandeep, 2017; Kaur *et al*., 2024).

Abandoned corrals can be strategically grazed by livestock or wildlife, providing valuable forage, especially during dry seasons. Controlled grazing can help maintain desirable plant species and prevent overgrowth by less palatable ones. In areas not designated for cultivation, management can focus on facilitating the recovery of native plant communities through passive or active restoration efforts. Techniques such as contour bunding, infiltration trenches and stone lines can be implemented to reduce runoff and enhance water infiltration (Mupangwa *et al*., 2012).

In areas where feasible, small-scale irrigation systems, such as solar-powered drip irrigation, can significantly increase water-use efficiency and crop productivity. Individual corral management should be nested within broader landscape and climate-smart agriculture strategies. Rotational kraaling, for example, can distribute fertility across the landscape, rehabilitate degraded patches and create a dynamic mosaic of productive areas (Huruba *et al*., 2018; Huruba *et al*., 2022). Effective sustainable utilization requires active participation from local communities. Traditional knowledge of kraal management should be integrated with scientific understanding through workshops, farmer field schools and peer-to-peer learning (Chaudhary *et al*., 2024; Kennedy *et al*., 2022). Governments and conservation organizations can play a crucial role by developing policies that recognize the value of abandoned kraals and provide incentives for their sustainable management.

CONCLUSION

Abandoned cattle corrals represent both an agroecological asset and a socioeconomic challenge in sub-Saharan Africa. Evidence demonstrates that former corrals harbor enriched soils with elevated nutrient concentrations, enhanced organic matter and altered physical properties, which can be harnessed for crop cultivation, pasture establishment and restoration of degraded lands. At the same time, their strategic reuse may contribute to food security, climate change adaptation and livelihood diversification in resource-constrained rural systems. However, these potentials are counterbalanced by important limitations, including spatial constraints, declining fertility with time since abandonment, risks of nutrient leaching and limited farmer awareness or institutional support for repurposing initiatives. Socioeconomic factors such as land tenure insecurity, labor shortages and competing land-use priorities further complicate their sustainable utilization.

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Conflict of interest

The authors declare that they have no known competing financial interest or personal relationships that could have appeared to influence any part of this article.

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