



# Enhancing Soil Fertility and Food Security Through Traditional Cattle Corralling Practices

## Evidences from in Northern Benin

Awouminassi M. Atakoun, Pierre G. Tovihoudji, Rodrigue V. C. Diogo, William Amponsah, Murilo dos Santos Vianna, Thomas Gaiser, Nicolas Kyei-Bafour, Boateng Kyereh

### INTRODUCTION



Agricultural productivity and food security are critical challenges in Northern Benin, where soil degradation and climate variability undermine sustainable farming practices. Traditional cattle corralling, a practice where livestock are confined overnight in specific areas, has emerged as a potential solution. This practice enhances soil fertility through the deposition of manure and urine, which enriches soil organic matter (SOM) and boosts soil organic carbon (SOC) levels. Recent research underscores its role in improving maize yields and contributing to climate resilience in semi-arid regions. This policy brief outlines the key findings, policy implications, and recommendations for scaling up cattle corralling as a sustainable agricultural practice in Northern Benin.

### KEY MESSAGES

- **Traditional cattle corralling practices significantly enhance soil fertility, maize yield, and carbon sequestration in Northern Benin.**
- **Fields corralled annually exhibit the highest soil organic carbon (SOC) content and maize yields, contributing to sustainable agriculture.**
- **Adopting cattle corralling as a soil fertility management practice can improve food security and support climate resilience in semi-arid regions.**

## METHODOLOGY

This study was conducted in the municipality of Gogounou, Northern Benin. Soil samples were collected from fields corralled annually, fields corralled in intervals of up to seven years, and non-corralled control fields. Soil physicochemical properties, including soil organic matter (SOM), soil organic carbon (SOC), bulk density, and macronutrient content (N, P, K), were analyzed. Maize yields were estimated based on farmer-reported data. The study also assessed soil carbon stock (SCS) and the relationship between maize yield and soil parameters using correlation and statistical modeling techniques.

## FINDINGS

### 1. Soil Physicochemical Improvements:

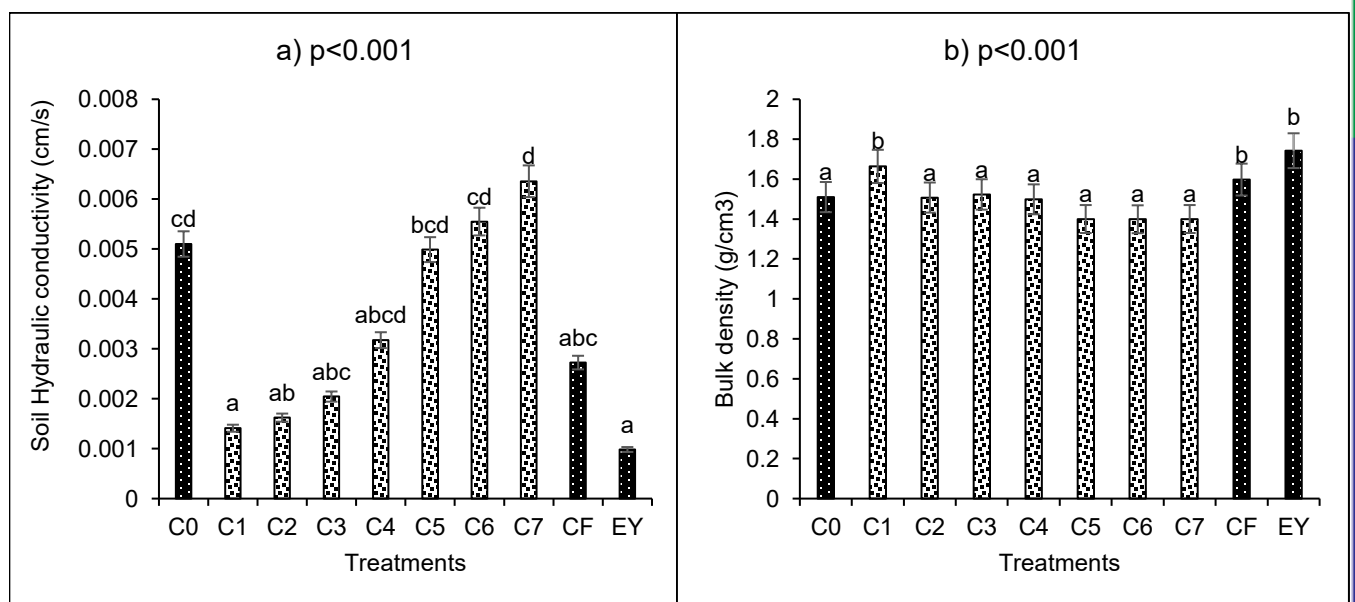
- Annual cattle corraling reduces bulk density and increases soil nutrient availability (N, P, K, Figure 1)
- Enhances water retention and soil structure, which are crucial for crop growth.

### 2. Maize Yield Enhancement:

- Annual corraling results in the highest maize yields, demonstrating its effectiveness as a soil fertility strategy.

### 3. Carbon Sequestration:

- Annual corraling increases SOC and soil carbon stocks, contributing to climate change mitigation efforts.



**Figure 1:** Effect of cattle corraling on soil hydraulic conductivity (a), and soil bulk density (b) over years.

**Table 1:** Key Findings on Soil Properties and Maize Yield

Field type	Maize yield (t/ha)	SOM (%)	SOC (%)	SCS (Mg/ha)
Non-corralled (C0)	1.60	0.6	0.3	11
Corralled annually (EY)	2.77	2.5	1.4	46.6
Corralled 5 years ago (C5)	1.30	1.1	0.6	20.2
Fallow control (CF)	1.50	1.1	0.7	21.5

## POLICY IMPLICATIONS

1. Promote traditional practices for soil fertility enhancement:

- Encourage smallholder farmers to adopt annual cattle corralling practices to improve soil health and increase crop yields.

2. Support Integrated Crop-Livestock Systems:

- Integrate cattle corralling with other sustainable practices, such as biochar application and cover cropping, to enhance nutrient retention and reduce soil degradation.

3. Develop training and resource programs:

- Provide training and resources to smallholder farmers for the effective implementation of cattle corralling practices.

4. Facilitate Access to Agricultural Inputs:

- Ensure the availability of affordable inputs such as mineral fertilizers and

organic amendments to complement cattle corralling.

5. Invest in Soil Monitoring and Research:

- Establish long-term soil monitoring programs to track changes in soil fertility and develop region-specific best practices.

## CONCLUSION

Traditional cattle corralling presents a cost-effective and sustainable solution for improving soil health and agricultural productivity in Northern Benin. Scaling up this practice through policy support, training, and integration with other sustainable practices can significantly enhance food security and resilience to climate change.

## ACKNOWLEDGMENTS

This policy brief is derived from research funded by the German Federal Ministry of Education and Research (BMBF) through the WASCAL program. Special thanks to Integrated Production Systems Innovation Lab and Sustainable Land Management (InSPIREs-SLM), and the smallholder farmers of Northern Benin for their collaboration and insights.



SPONSORED BY THE



Federal Ministry  
of Education  
and Research

