# Enduring gains in maize yield and soil hydraulic function from cocoa pod husk compost in Ghana

Eric Oppong Danso, Jacob Ulzen, Alfred Asuming-Boakye

University of Ghana, Forest and Horticultural Crops Research Centre, Ghana

## Introduction

- Ghana generates about 6 million tonnes of cocoa pod husk annually (Bannor et al., 2024).
- The application of organic amendments on the surface of soil without incorporation leads to nutrient losses through runoff and volatilization.
- The effectiveness of subsurface compost placement under tropical field conditions remains insufficiently understood.
- This study evaluated the effects of cocoa pod husk compost placement depth on maize yield and soil hydraulic conductivity over three growing seasons.

## Materials and Methods

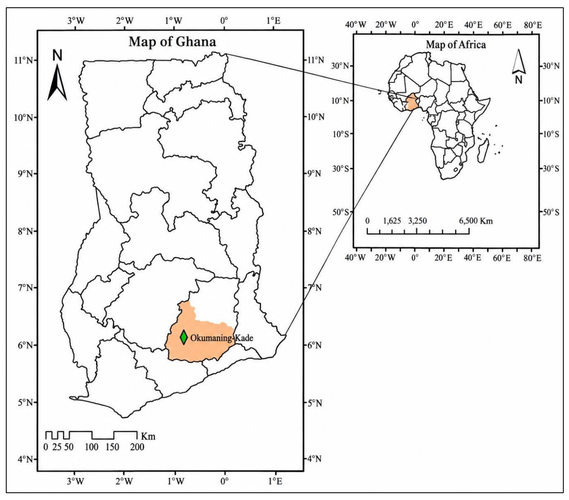



**Fig. 1|** Map of Ghana (left) showing the study site and map of Africa (upper right)

- Three growing seasons (May 2025 – March 2026)
- **20 t ha$^{-1}$** compost application rate incorporated at either **0 – 15 cm** or **15 – 30 cm**
- Two irrigation regimes (Irrigated and Non-irrigated)


**Figure 2|**. Workflow showing cocoa pod husk collection, compost production, incorporation of compost into the soil, and irrigated maize production.

- Measured variables: **Total dry matter yield**, **grain yield, and soil hydraulic conductivity.**

## Results

Compost increased grain yield across all seasons and irrigation regimes. The strongest response was a **177% increase under irrigation with Compost + Subsurface application in the first season**

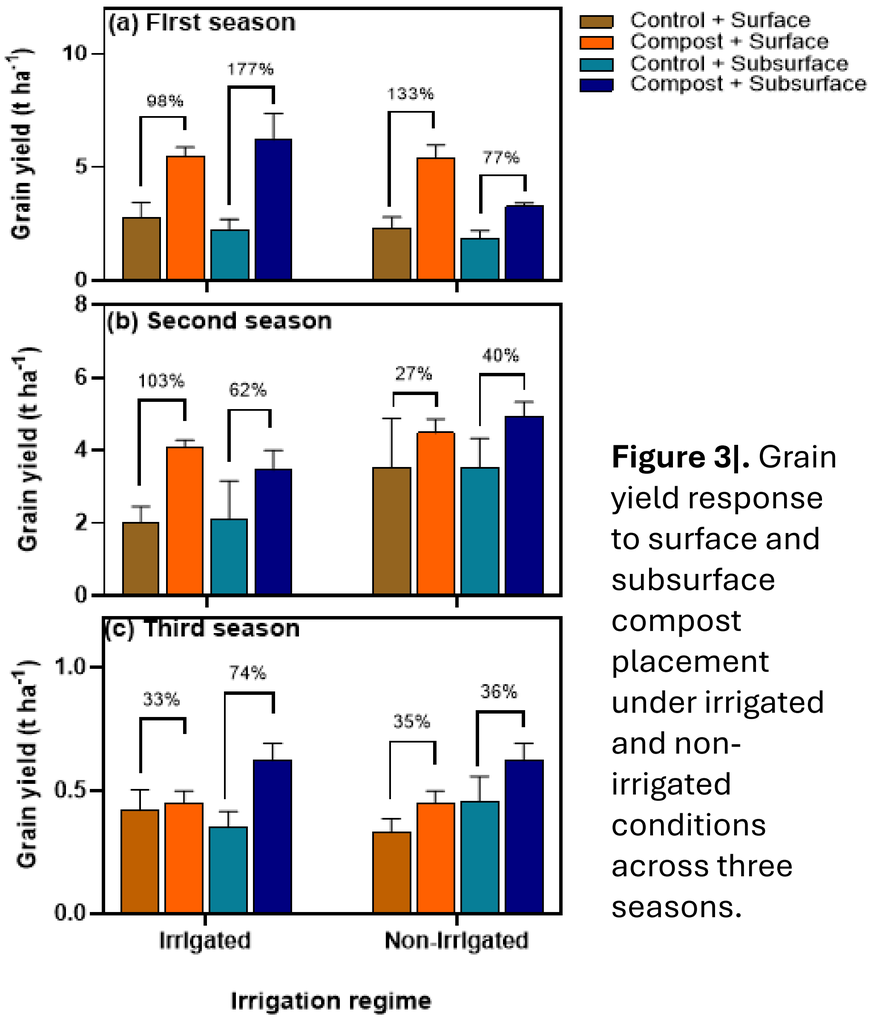



**Figure 3|.** Grain yield response to surface and subsurface compost placement under irrigated and non-irrigated conditions across three seasons.

Compost markedly increased hydraulic conductivity at both placement depths. The strongest effect was observed with surface placement, where hydraulic conductivity increased by 277% relative to **the control**.

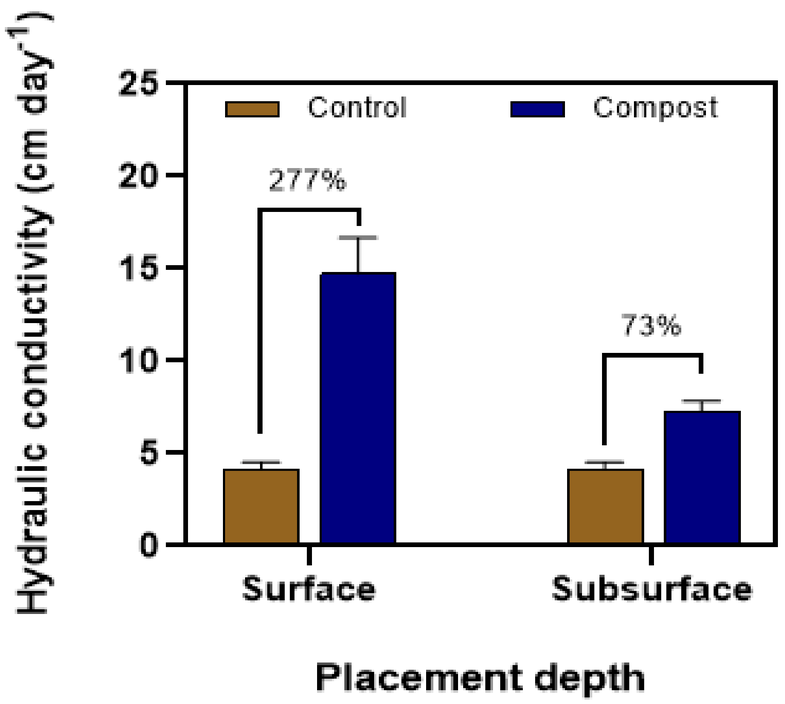
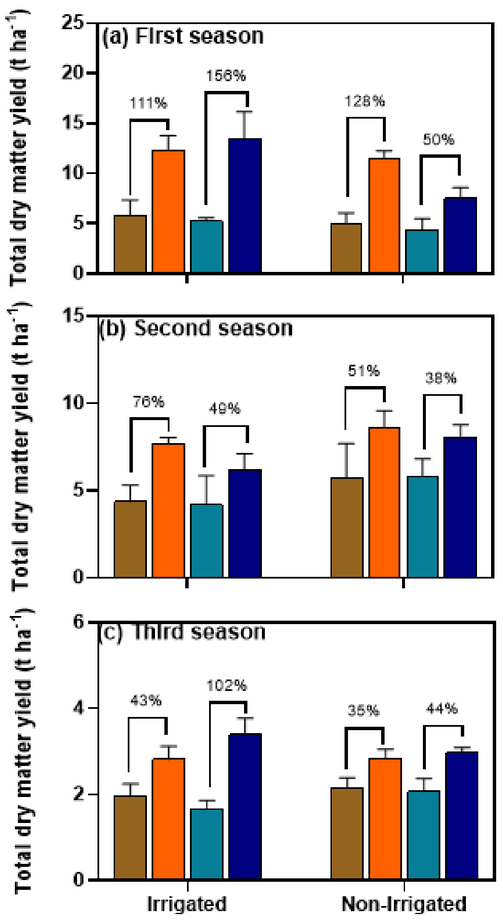



**Figure 4|.** Effect of compost placement depth on soil hydraulic conductivity under surface and subsurface application.




Compost increased total dry matter yield across all seasons and irrigation regimes. The highest response was **156% under irrigation with Compost + Subsurface application in the first season**.

**Figure 5|.** Total dry matter yield under surface and subsurface compost placement across irrigated and non-irrigated conditions over three seasons.

Compost application increased soil water-holding capacity at both placement depths compared with the control. The increase was about **6% at the surface** and **8% in the subsurface**, with the highest water-holding capacity observed under subsurface compost placement

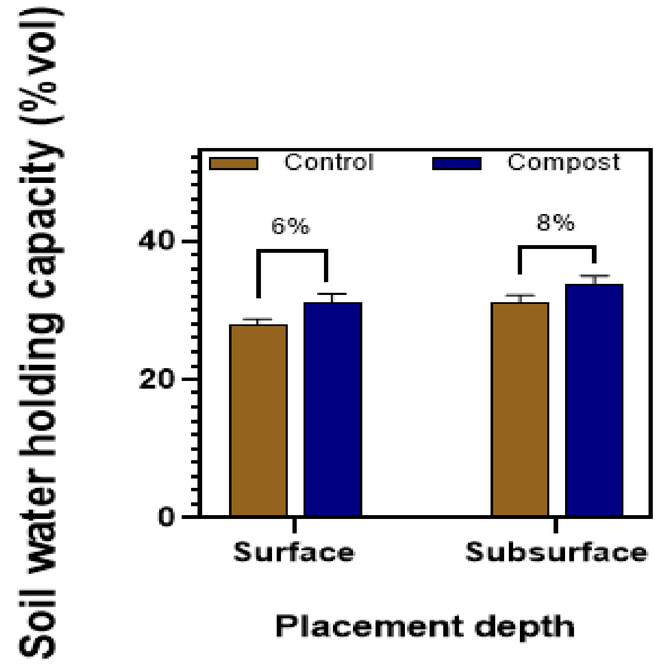



**Figure 6|.** Effect of compost placement depth on soil water holding capacity under surface and subsurface application.

## Conclusions

- Compost application significantly increased maize yield across all three seasons, regardless of the placement depth
- Compost applied by surface incorporation improves hydraulic conductivity