The cocoa yield gap in Ghana: A quantification & an analysis of factors that could narrow the gap

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Background

Expansion of area planted with cocoa to increase production is driving deforestation in major cocoa producing countries. With growing demand for cocoa, there is need to evaluate opportunities that increase yields on existing lands to meet demand and reduce pressure on forests and food security.

Objective

1. Quantify the cocoa yield gap using a crop model by simulating water limited potential yields as the theoretical upper limit in a rainfed system.
2. Assess the extent to which environment and management factors explain the yield gap

Method

CASE2, a physiological crop growth and production model for cocoa, was used to simulate water-limited potential yields in 93 cocoa farm locations in Ghana.

Absolute yield gap was calculated as the difference between maximum water-limited yield (or attainable yield in high-input or attainable yield in low-input systems) and actual yield. Mixed effects models were used to relate both absolute and relative yield gap to environment and management factors.

Results

Magnitude of the cocoa yield gap in Ghana

- Considerable yield gaps were found on all cocoa farms (Figure 1).
- Yield gaps based on water limited yields were considerably larger than attainable yield gaps of high input and low input systems

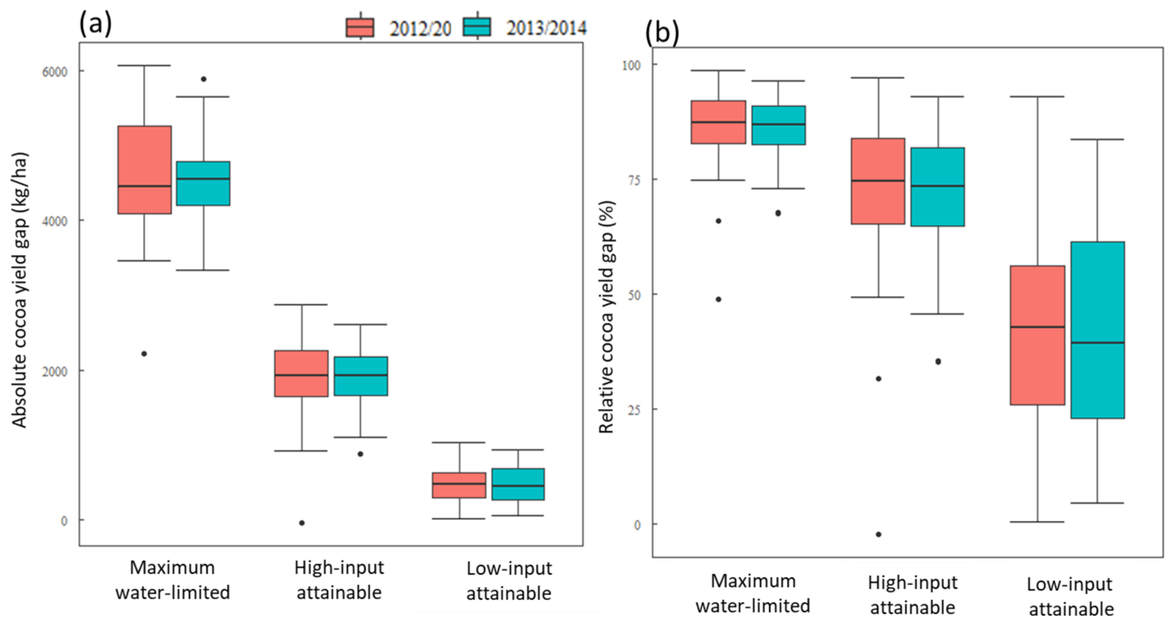

Figure 1. *Variation in absolute & relative yield gap for cocoa based on maximum water-limited yield, attainable in high-input and low-input across cocoa farms in Ghana. (Asante et al 2022)*

Determining factors of the cocoa yield gap in Ghana

- Larger maximum water limited absolute yield gaps in wetter areas but absolute attainable yield gaps attainable in low input systems was driven by management factors.
- Regardless of climate, relative yield gaps were reduced by management practices, particularly cocoa tree density and black pod control

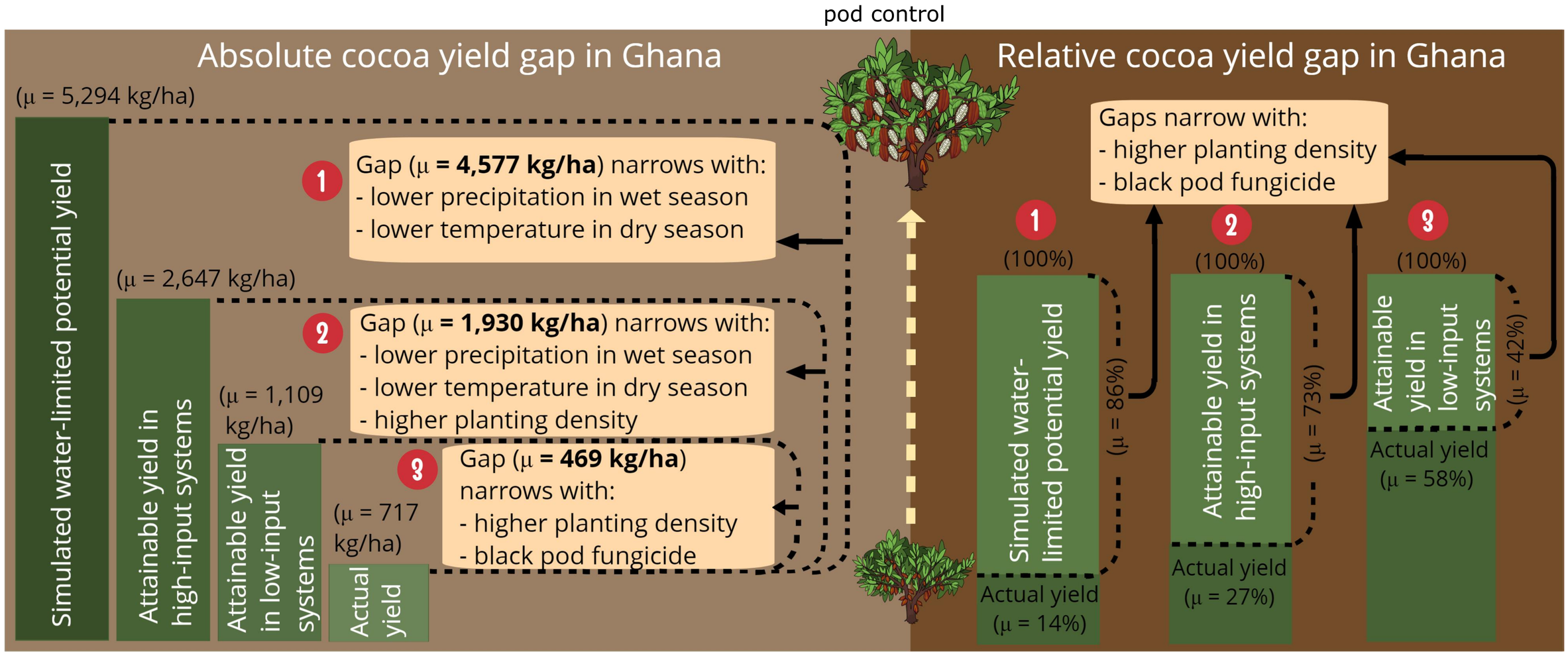

Figure 2. *The absolute and relative cocoa yield gaps across farms in Ghana based on maximum yield attainable in rain-fed system (simulated water-limited potential yield) and the attainable yields in high- and low-input systems. (Asante et al 2022)*

Conclusions

Climate drives the absolute maximum water-limited and attainable yield gaps in high-input systems in Ghana but not in low-input systems whilst agronomic management reduces relative cocoa yield gaps. This suggests large opportunities for increasing yields beyond current levels and hence farmer income.

Acknowledgements

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