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Evaluation of Yield Gap and Production Factors in Cocoa Systems Along a Climatic Gradient in Ghana

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Abstract

Factors limiting cocoa production include infestation of pests and diseases, low soil fertility, poor management practices, excessive shade and above all climate change. Sustainable intensification through climate smart agriculture has been identified as the way forward. In this context, soil conservation and knowledge of agroforestry could ensure sustainability and resilience to climate change while increasing yields. The cocoa growing region of Ghana is predicted to experience increased temperatures, resulting in higher evapotranspiration rates, as well as more erratic rainfall patterns and longer dry seasons, causing heat and water stress. Despite an increase of cocoa productivity over the last decade in Ghana, the estimated national average of 400 kg ha⁻¹yr⁻¹ is still low compared to yields from other countries.

The present study aimed at assessing the cocoa yield gap in three sites along a latitudinal (rainfall) gradient in the cocoa belt of Ghana. Surveys were carried out with 50 farmers per location. Farmers were interviewed about their management practices, and farms were subsequently visited for inventories on cocoa and shade trees, soil and foliar sampling, and an assessment of pests and diseases.

Cocoa yield gap per location is estimated by means of a boundary line analysis. Contribution of production factors (such as soil fertility, agricultural management, pests and diseases) to yield losses are expressed as percentage of attainable yields. The results will then be put in the context of climate change. Considering the potential impact of climate change on cocoa production in Ghana, and the unpredictability of yield outcomes of adaptation measures that farmers are facing today, such a study can guide in setting priorities for location specific adaptation strategies.

Keywords: Climate change, cocoa, intensification, productivity, soil fertility, sustainability, yield gap