How Much Palm Fruit You Lose if Water is in Short Supply

Understanding climate-determined yield ceiling is useful for management decision-making such as fertilizer strategies or identifying suitable productive land. In this study, we simulated the potential yield limited by solar radiation only and potential yield limited additionally by water for two oil palm growing regions – Indonesia and Ghana - using the physiological oil palm model PALMSIM (Hoffmann et al., 2014).

PALMSIM simulates growth and yield of oil palm on a monthly time step for the commercial life time of 30 years taking into account solar radiation and water availability. Climate data for two sites in Indonesia and Ghana were derived from a stochastic weather generator using the WorldClim weather data base (Jones and Thornton, 2013).

Comparing these two regions, two points become clear (Figure 1 & 2): (i) potential fresh fruit bunch (FFB) yield is in a comparable range of 40 t/ha in the plateau phase due to similar incoming solar radiation over the year. (ii) However, the gap between water-limited potential yield and potential yield is significant differently at the two sites. Due to relatively low rainfall of around 1500 mm/ year the attainable yield for oil palm growers in Ghana is much lower than in Indonesia with rainfall > 2500 mm/year.

For Ghana, the simulated gap between water-limited and potential yield is more than 15 t FFB/ha.

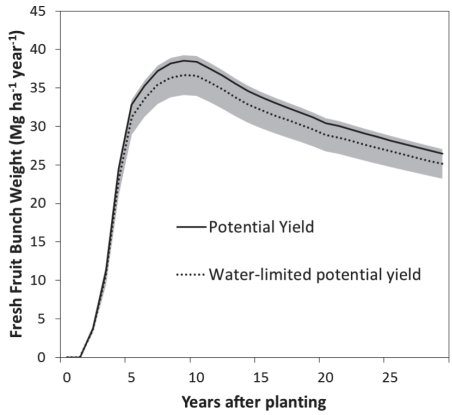

Figure 1: Simulated yield for one site in Indonesia.

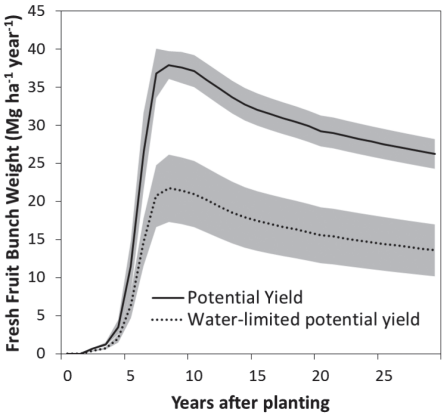

Figure 2: Simulated yield for one site in Ghana.

IPNI helps developing best management practices in areas with water deficit in Ghana, West Africa. Photo by Thomas Oberthür.

References:

Hoffmann, M.P., A. Castaneda Vera, M.T. van Wijk, K.E. Giller, T. Oberthür, C. Donough, and A. Whitbread. 2014. Simulating potential growth and yield of oil palm (Elaeis guineensis) with PALMSIM: Model description, evaluation and application. Agric. Syst. 131: 1–10.

Jones, P.G., and P.K. Thornton. 2013. Generating downscaled weather data from a suite of climate models for agricultural modelling applications. Agric. Syst. 114: 1–5.