Tropentag, September 17-19, 2018, Ghent

"Global food security and food safety:
The role of universities"

Let There Be Light: Light Interception Method Update for Oil Palm (*Elaeis Guineensis* Jacq.) Canopies

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Abstract

Light interception (photosynthetically active radiation, PAR) experiments in oil palm (*Elaeis guineensis* Jacq.) plantations are scarce and often performed decennia ago, in Southeast Asia and without a clear methodology. This is a great opportunity for research with recent planting material in West-African growing conditions. Therefore a light interception experiment was performed in Nigeria. The first objective of this study was to put forward a recommendation regarding PAR interception assessment under oil palm canopies. Therefore a fixed and mobile PAR interception sampling method were compared. The second objective was to reveal PAR interception distribution under an oil palm canopy. In this study, PAR interception was monitored in oil palm plots of five different planting densities (128, 143, 160, 180 and 205 palms ha^{-1}), eleven years after oil palm planting. During the fixed sampling, PAR was measured on sixteen equidistant locations below canopy with a quantum sensor (QS5 Quantum Sensor, Delta-T Devices). During mobile sampling, measurements were carried out by walking along two regular paths while holding the quantum sensor by hand. PAR above canopy was measured simultaneously during sampling below canopy. This study found no significant differences between the fixed and mobile PAR interception sampling methods ($p > 0.99$), and this in the five different planting densities. Furthermore it was discovered that four regular fixed sampling locations below an oil palm canopy are sufficient for an exact assessment of PAR interception. This study showed also that PAR interception was randomly distributed under the canopy without a decreasing trend of PAR interception away from the oil palm trunk. Finally, there was no significant difference in PAR interception due to the shifting position of the sun between 10 a. m. and 2 p. m. ($p > 0.78$). It is recommended to assess PAR interception with a fixed sampling method considering its ease, although data from both mobile and fixed methods are comparable. The standardisation of the fixed PAR interception method is easier due to the lower probability of human error compared to the mobile PAR interception method.

Keywords: Canopy, *Elaeis guineensis* Jacq., light interception, Nigeria, oil palm, PAR, photosynthetically active radiation, quantum sensor, West Africa

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