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Shade trees improve coffee health without reducing (too much) coffee potential yield

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Shade trees are increasingly recognized to benefit to biological regulation in tropical agroforestry systems (AFS). However, studies have revealed contradictory results for cryptogrammic diseases, suggesting strong interactions with local abiotic conditions and management. In AFS, the development of diseases depend on microclimate modifications caused by shade trees. Here, we aimed at evaluating the impacts of shade trees on disease infestation within coffee AFS in Central Kenya (Murang'a). We mapped and assessed the horizontal and vertical structure of 15 AFS plots with contrasting shade tree cover and spatial organization. We monitored the incidence and severity of Coffee Berry Disease (CBD) and Coffee Leaf Rust (CLR) on 50 coffee plants with contrasting shading conditions within each plot during the harvest in 2010. Our results showed that coffee under trees, especially under dense-canopy trees (e.g. Macadamia, Mango), have similar yield potential (around 2.35 kg of cherries/coffee plant, estimated over 5 fruiting branches) but significantly lower CBD (– 53 %) and CLR (– 13 %) symptoms. At the plot level, intermediate and homogeneous canopy tree cover enabled lower disease infestation. In addition, we showed that architectural traits of trees (e.g. growth habit, total height, crown size, foliar density) can modulate the impact of shade trees on disease regulation. Our results open perspectives for designing complex canopy structure towards healthier tropical AFS.

A coffee AFS in Central Kenya (Murang'a region). Species, location and size of each shade tree have been recorded. Coffee yield, CBD and CLR have been monitored in spring 2010.

Keywords: Coffee agroforestry, Coffe Berry Disease, Coffee Leaf Rust, Spatial structure, Kenya.