Tropentag, September 16-18, 2015, Berlin, Germany

"Management of land use systems for enhanced food security: conflicts, controversies and resolutions"

Climate-Smart Intensification of Coffee and Cocoa Smallholder Systems in Africa

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Abstract

Coffee and cocoa demand on the world market continues to expand annually by 2–3 %. Over 5 million African smallholder families depend on these cash crops for their livelihoods. However, cocoa and coffee yields are low (10–30 % of potential) and highly variable with limited use of external nutrient inputs. Research shows that poor soil fertility is largely responsible for those low yields, together with pests and diseases and poor management practices. Over the past decades, supply growth largely depended on the expansion of the crop into natural/fallow land. Consequently, cocoa has been a key driver of deforestation and less than 15 % of the original forest cover in West Africa remains. The industry is increasingly concerned about future supply, particularly now that climate change further threatens the current production zones. Climate-smart intensification is required to ensure both smallholder livelihoods and the industry's need. Over the past decades, full-sun production systems have been promoted by public authorities and industry actors. Whereas these systems are often perceived to have the highest production potential, they do expose farmers to risks of climate variability and reduced sustainability. Novel integrated soil fertility management (ISFM) options are designed, combining (i) targeted fertiliser applications based on foliar and soil nutrient diagnostic tools, (ii) no-till mulched systems and

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(iii) inter-cropping with shade crops (e.g. bananas) and (leguminous) trees. Such systems improve both production quantity and resilience. Additional fruit and fire-wood diversifies farm income and food security. Increased carbon storage above- and below-ground (10–60 $^{t}/_{ha}$) further contribute to climate change mitigation. Producing more on the same area due to sustainable intensification could have avoided 21,000 km^2 of deforestation and forest degradation in West Africa, equivalent to nearly 1.4 billion t of CO_2 emissions. Expanding sustainable intensification efforts to the Congo basin is needed to (i) reduce poverty, (ii) respond to industry demand, and (iii) 'compensate' for production area loss in West Africa. This requires (i) novel partnerships between agricultural and forest conservation actors and (ii) commitment from the industry to invest in sustainable supply chains, both from an economic, human and environmental perspective. Certification labels can further accelerate this.

Keywords: CO_2 emissions, Congo basin, deforestation, external nutrient inputs, poor soil fertility, West Africa