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# Book of Abstracts

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## Young shade trees rapidly improve soil fertility in coffee-agroforestry systems

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*Background and aim*
Highly productive monoculture coffee (*Coffea arabica* L.) farms have rapidly expanded since the 1990s in Yunnan Province, China. In 2013, in order to initiate a large-scale transition towards more sustainable coffee growing practices, local government in southern Yunnan started distributing free shade tree seedlings to all coffee farmers in their jurisdictions. This study highlights the impact of three of these promoted shade tree species (*Cinnamomum camphora*, *Bishofia javanica* and *Jacaranda mimosifolia*) on soil fertility and coffee production only four years after their distribution to coffee farmers.
*Materials and methods*
Soil samples in the 0-20 cm soil layer were tested for chemical composition (soil organic matter, pH, total N, available P, exchangeable K, Ca and Mg), soil communities (free-living nematodes and microbial communities) and soil enzyme activities (β-glucosidase, N-acetyl-glucosaminidase and acid phosphatase) under shade trees (6 replicates per tree species) and in open areas (15 replicates), both in coffee rows and inter-rows, once during the rainy and once during the dry season. Additionally, we characterized root systems and soil water profiles to a depth of 1.2m, monitored litterfall for one year, as well as coffee production for two years.
*Major results*
We detected a clear positive impact of all three shade tree species on soil chemical, biological and biochemical fertility, despite the marked effect of 20 years of high mineral fertilizer inputs. In particular, we measured higher pH and soil organic matter; similar or higher soil enzyme activities throughout the year; more abundant fungi communities throughout the year; and more abundant microbial communities during the dry season below shade trees than in open areas. Furthermore, coffee trees shaded by *B. javanica* and *J. mimosifolia* yielded as much as open coffee trees. On the other hand, coffee trees shaded by *C. camphora* yielded less than open coffee trees, most likely as a result of high root competition from this shade tree species. Lastly, shade trees had no visible impact on coffee organoleptic quality.
*Conclusion*
These results demonstrate that carefully selected shade trees can rapidly contribute to preserving and/or restoring soil fertility in intensive coffee systems, while maintaining high coffee yield.

**Keywords:** Arabica coffee, China, PLFA, Soil enzyme, Soil fertility.