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Effects of pruning on workload and yields of native cacao under agroforests in Bolivia

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Abstract

Cacao Nacional Boliviano (CNB) is the denomination for cacao derived from wild populations found in the Bolivian Amazon, traditionally collected by local communities. But cultivation surfaces are increasing as CNB beans are recognised internationally for their organoleptic qualities. So far, little selection has been done on the semi-wild populations cultivated and agricultural practices might have to be adapted to better support farmers' livelihoods.

We studied three different agricultural systems: CNB in agroforestry with bananas, fruit and timber trees with a management focusing on weeding and cacao pruning (AF); CNB planted in the cleared understory of a largely unmanaged secondary forest with (SFwP) or without (SFnP) cacao tree pruning. We monitored the yearly dry bean yield, labour time required for field activities, and resulting efficiencies of these three systems on plots established in 2012. Cacao was planted using CNB progenies from locally selected trees.

In all systems, the first cocoa pods matured 4 years after planting; production increased significantly in the 6th year and again between the 9th and 11th year. Cumulative dry yields in this third phase (2020-2022) were highest in SFnP (911.2 kg ha⁻¹), followed by AF (591.2 kg ha⁻¹) and SFwP (277.8 kg ha⁻¹). Heavy pruning was labour-intensive (up to 56% of total labour time) and limited yields but increased harvesting efficiency in the following years without pruning. In 2020-2022, harvesting in SFnP was 5 times more laborious as in SFwP and 2.7 times more as in AF, while its yield was only 3.3 and 1.5 times higher, respectively. Harvesting efficiency was thus higher in both pruned systems (AF: 7.3 kg workday⁻¹, SFwP: 6.7 kg WD⁻¹), compared to the unpruned system (4.4 kg WD⁻¹).

Our results underline the delicate balance between the practice of pruning, aiming at facilitating and concentrating the harvest at a limited height, and its effect on cacao physiology. Yet, association in AF shows that in completely managed systems, CNB is able to reach fair yield levels despite pruning. All in all, our results call for further domestication of CNB progenies aiming at earlier start of production, and adaptation of management practices (timing and intensity of pruning) for CNB.

Keywords: Bolivia, cacao agroforestry, native cacao, pruning