

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

Background

- ❖ Cacao Nacional Boliviano (CNB) is cacao derived from wild populations found in the Bolivian Amazon, still traditionally collected by local communities.
- ❖ CNB beans possess internationally desired organoleptic qualities and interest for cultivation is growing.
- ❖ Yet, little selection has been done yet on the semi-wild populations cultivated and current agricultural practices might have to be adapted for CNB to better support farmers' livelihoods.

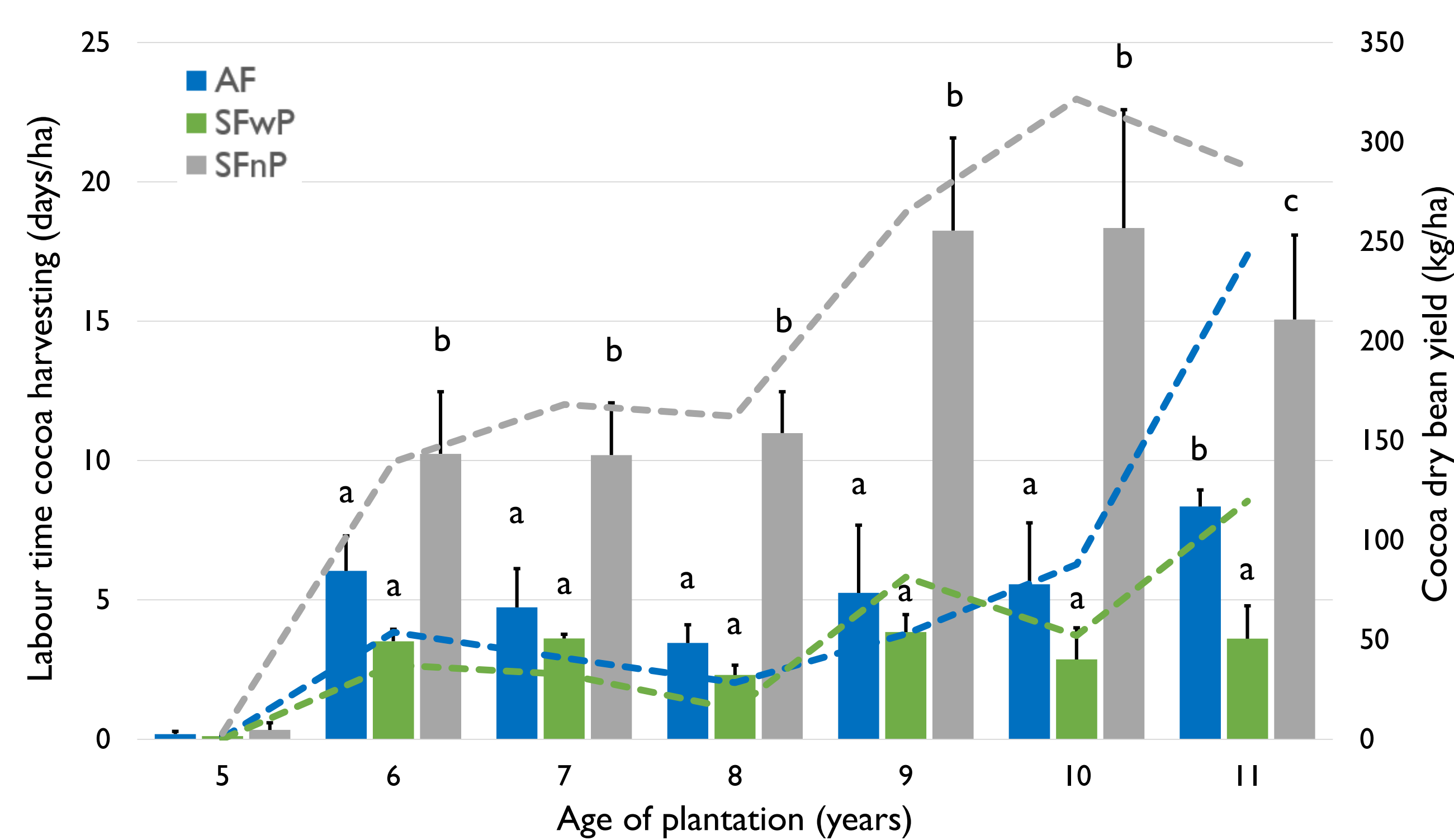


Figure 1: Yearly evolution of harvesting time (bars) and cocoa yields (lines) within the three systems studied. Letters show statistical differences in harvesting time between systems for each year.

Methods

- ❖ Study area: Sara Ana (Alto Beni region), Bolivia
- ❖ Three different agricultural systems were studied: CNB in agroforestry with bananas, fruit and timber trees with a management focusing on weeding and cacao pruning (AF); CNB planted in cleared understory of a largely unmanaged secondary forest with (SFwP) or without (SFnP) cacao tree pruning. SFnP approximates the local practice of collection from wild unmanaged cacao trees.
- ❖ Data collection: yearly dry bean yield, labour time required for field activities, and resulting efficiencies of these three systems
- ❖ Plots were established and planted in 2012 (density: 625 cacao trees/ha.)

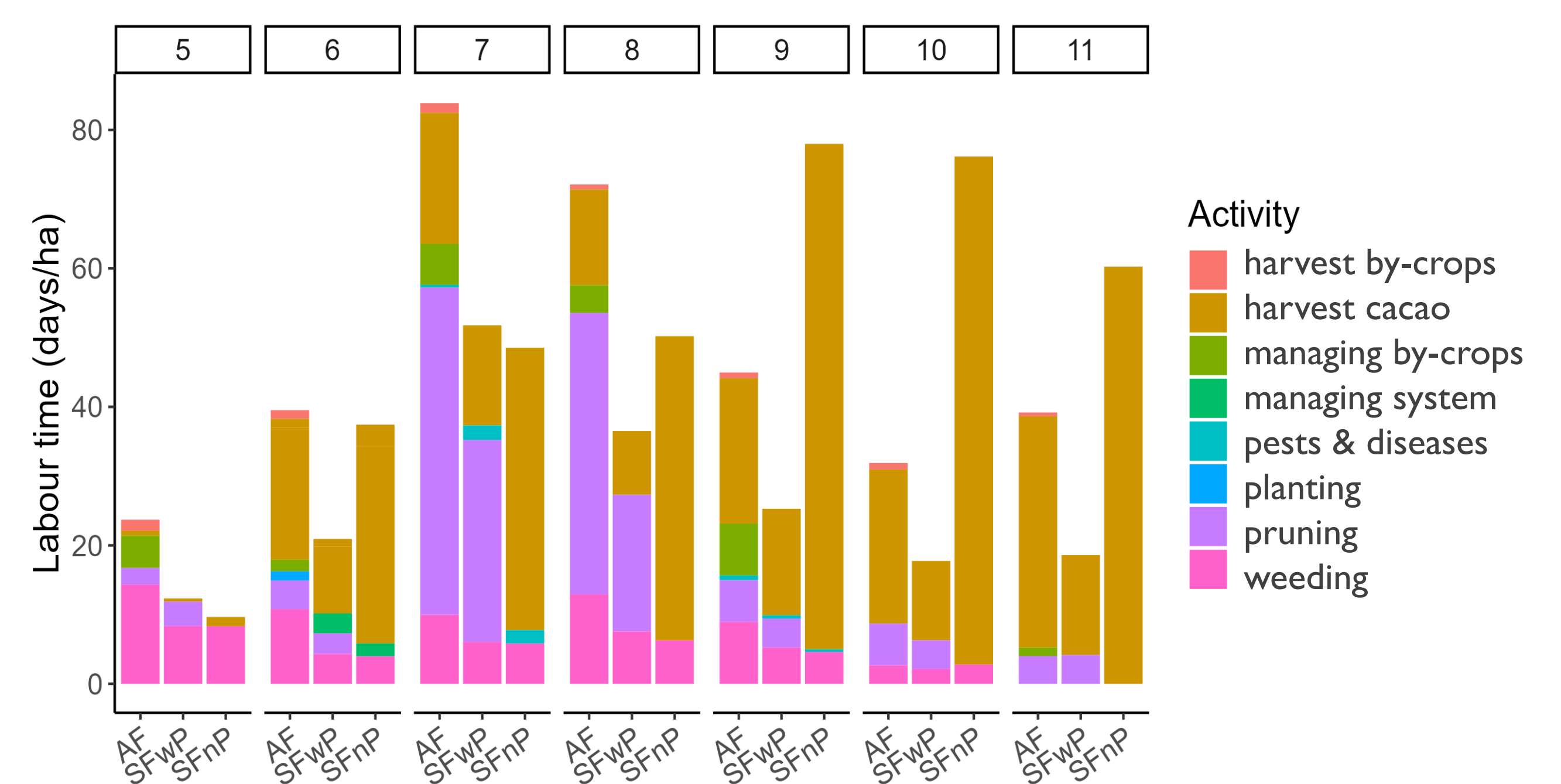


Figure 2: Yearly evolution and composition of labour time within the three systems studied (grouped by age of plantation; 5-11 years). Labour times are estimated for cacao harvesting 2016 and cacao pruning 2020-2022.

Results

- ❖ In all systems, the first cocoa pods were harvested in the 4th year since planting (not shown here). Production increased significantly in the 6th year and again between the 9th and 11th year (fig. 1). We can thus distinguish 3 phases.
- ❖ Cumulative dry yields in the second and third phase (years 6-11) were highest in SFnP followed by AF and SFwP (fig. 1).
- ❖ Pruning was labour-intensive (up to 56% of total labour time; fig. 2) and limited yields, but increased harvesting efficiency at higher number of pods to be harvested (fig. 3). As a consequence, return on labour increased over time with increasing yield and, in years 9-11, was close to or higher in both pruned systems to that of SnFP (fig. 4).

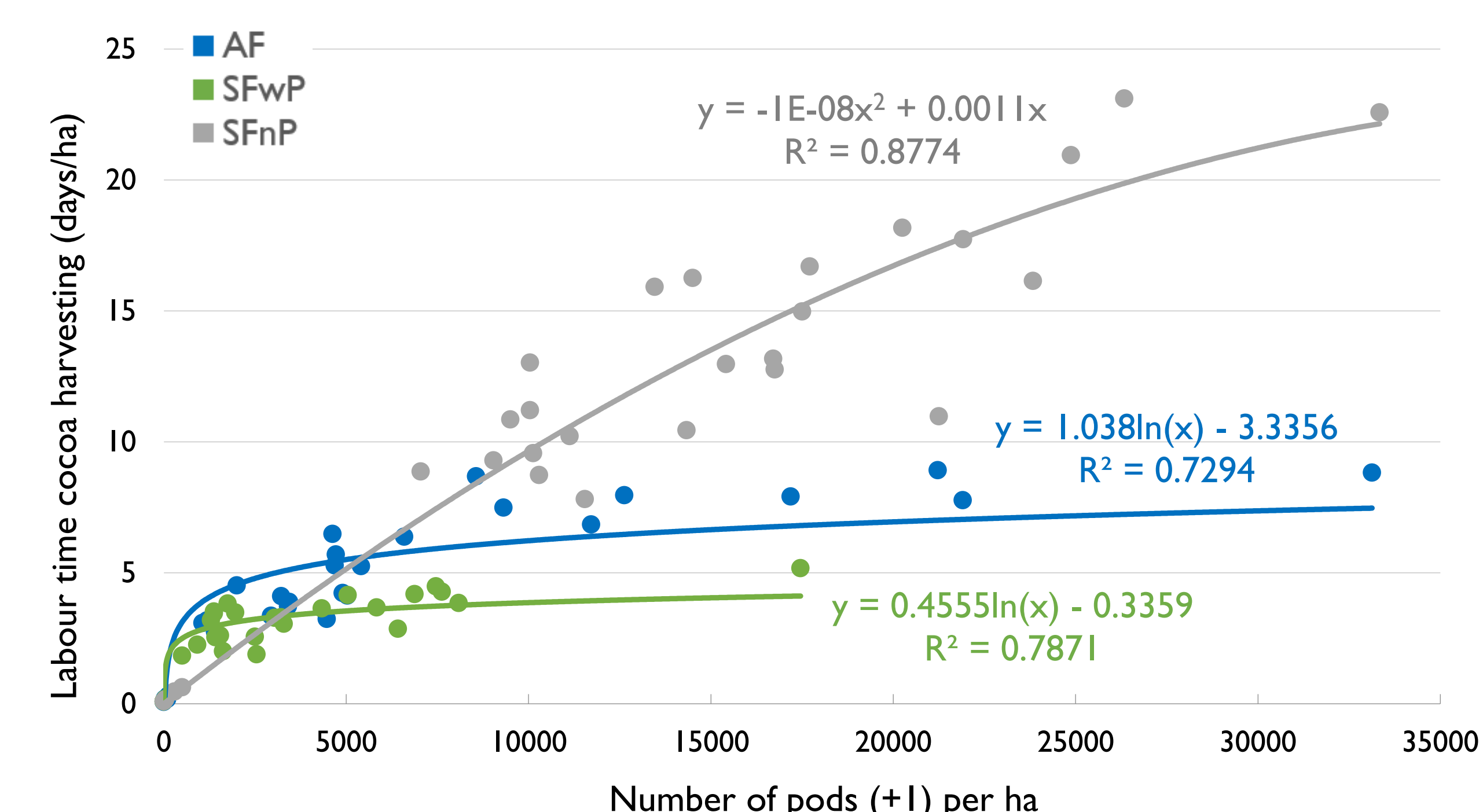


Figure 3: Relationship between number of pods and required harvesting time

Conclusion

- ❖ 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 (e.g. yield vs. vegetative growth). Yet, the case of AF shows that in completely managed systems and despite pruning, CNB is able to reach yields that are paying off the investment in comparison to unmanaged plantations.
- ❖ These findings call for further domestication of CNB progenies aiming at an earlier start of production and higher yields, as well as further adaptation of management practices to CNB phenology (e.g. the intensity and timing of pruning) in order to increase yield and return on labour.

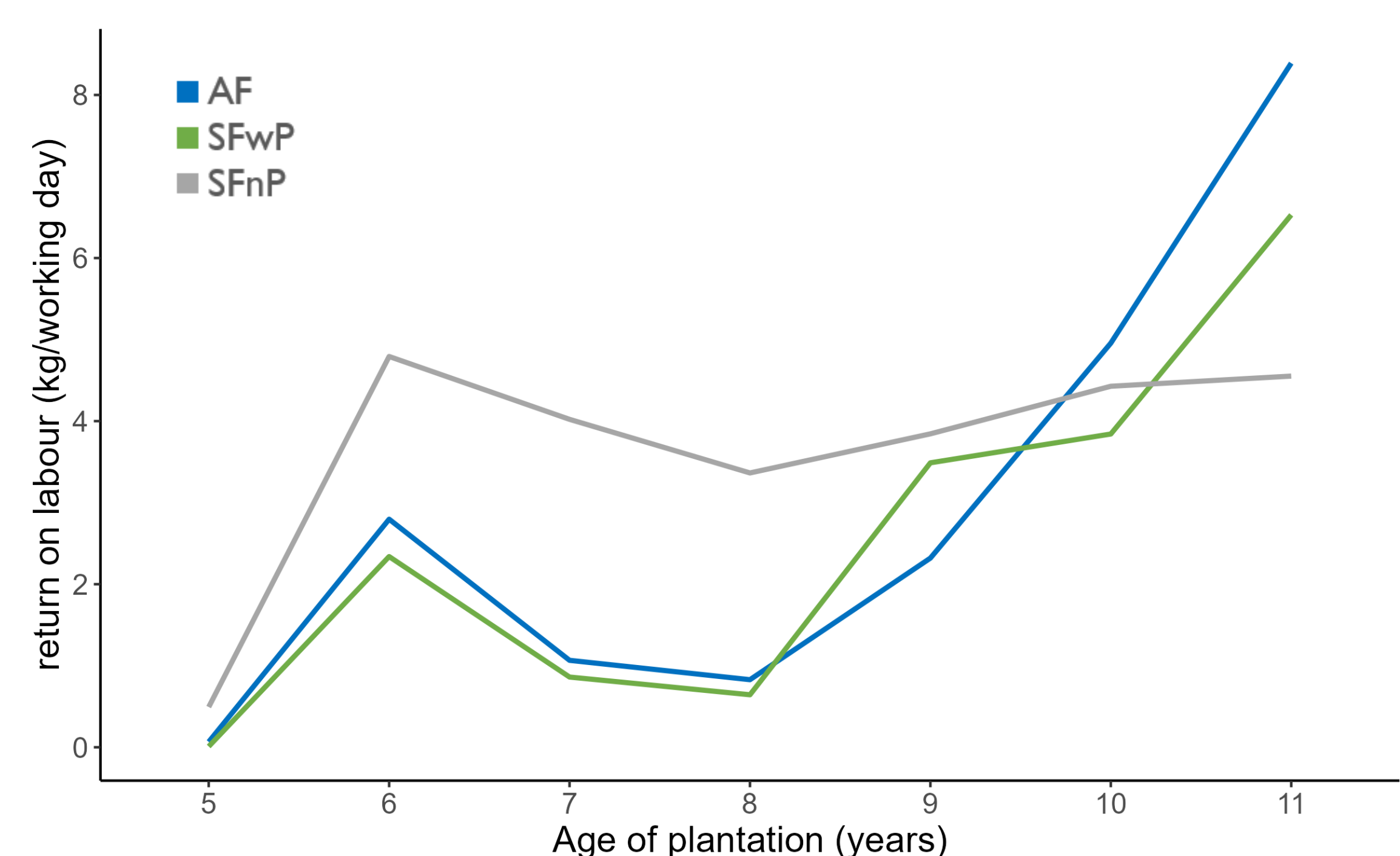


Figure 4: Development of return on labour over time (ratio of dry bean yield per working day of field labour) in the three systems studied.