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Local knowledge on the role of trees in coffee agroforestry systems of Northwest Vietnam

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Over the past decades in Northwestern Vietnam, Arabica coffee systems have been moving towards intensified, full sun monocultures that are not long-term sustainable and have negative environmental impacts. As most of the farming systems in this area are on sloping land (approximately 75% of the total farmed area), these systems are associated with very high levels of soil erosion, loss of biodiversity. This, in turn has contributed to declines in agricultural productivity. There is now a need reverse these trends and better integration of agroforestry is one potential option. Indigenous coffee systems often use trees for shade. A survey of 124 farmers from three indigenous groups was conducted in Northwest Vietnam to document the characteristics of these shaded coffee agroforestry systems. This included systematic acquisition of the local knowledge of the ecosystem services and disservices that rural communities associate with the different tree species used within these systems.

Our results show that tree species richness in shaded coffee agroforestry plots was much higher compared to other farming systems in the area (including maize, orchards, and timber plantations). Farmers had in-depth knowledge of environmental benefits of different trees in their systems including their capacity to reduce soil erosion, improve soil fertility, enhance biodiversity and reduce damage from wind and frost. Interestingly farmers had limited knowledge on both how trees affected coffee quality and yield as well as their role in light and nutrient dynamics. The leguminous shade tree species (*Leucaena leucocephala*) was the highest ranked tree in terms of providing most ecosystem benefits. Nonetheless, farmers' selection of tree species in their shaded coffee systems was more heavily influenced by economic value associated with the intercropped trees. Our survey shows that there were fewer native species in the areas with better road accessibility (in these systems the road is synonymous with the market) despite the recognition of their value to coffee systems. Consequently, *Leucaena leucocephala* was only maintained in areas away from roads. This study highlights areas where we can target learning to improve the uptake of trees with high environmental value and highlights challenges associated with tree selection as Vietnam attempts to move towards more climate smart agricultural systems.

Keywords: local knowledge, ecosystem service, coffee agroforestry, tree diversity, tree selection.