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Growing horticultural crops within agroforestry systems: state of the art and perspectives

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In numerous traditional agriculture systems, fruit and vegetables are grown near or under trees. These systems could play a particularly important role for food security, but could also benefit biodiversity and enhance the provision of ecosystem services such as carbon storage. Yet, to date, no study has attempted to provide a comprehensive systematic synthesis of the characteristics and performance of horticultural crops grown in agroforestry systems. To understand the current state of evidence, we systematically searched for studies from around the globe documenting the performance of horticultural-agroforestry systems (HAFS) based on field experiments. We identified and characterised the results of 1024 individual field experiments conducted from 1982 to 2021 in 68 countries across the 6 continents. The majority of studies represent HAFS in India, China and Brazil, while Europe and North America together represent less than 11 % of studies. The HAFS collated include a high diversity of complexity in term of number of cultivated species. For example, we identified 275 horticultural species, including 86 annual and 189 perennials. Tree and crops were mostly arranged in alley cropping systems in the HAFS represented in the database, especially in Europe and North America. Relatively few studies focus on homegardens or multistrata systems, despite these arrangements forming the basis of food security for tens of thousands of farmers. We found that three variables are more frequently investigated in studies on HAFS: yield (56% of the outcomes reported), soil quality (25%) and biodiversity (8%). Socio-economic parameters (e.g., farmer well-being, market access, profitability) were rarely investigated. Our study highlights the diversity of HAFS and shows that large knowledge gaps exist especially for more complex agroforestry systems. We call for more extensive and multi-criteria evaluations of traditional horticultural agroforestry systems.