Rural development projects should be assessed before large-scale farmer involvement. Scant data are available in African countries on the sustainability of farming systems to produce food, enhance smallholder incomes, and reduce greenhouse gas (GHG) emissions. This study was based on a rural development project in Madagascar that promoted agroecological practices—agroforestry, compost and systems of rice intensification (SRI). The potential benefits of the project were quantified by three indicators: GHG balance, economic benefits to farmers and effectiveness of economic GHG mitigation investments. These indicators were projected over a 20-year period according to three scenarios, i.e. two that differed in terms of two agroecological practice adoption levels were compared to a baseline scenario with no project intervention. Socioeconomic, crop yield and soil data were collected on 192 farms over five crop seasons (2013-2018). The GHG balance was estimated with 2 calculators: the TropiC Farm Tool and the EX-Ante Carbon-balance Tool. GHG emissions were reduced under both scenarios compared to baseline: -5.2 to -13.6 tCO₂eq farm⁻¹ year⁻¹ for scenarios 1 and 2, respectively. The amount of carbon saved per euro invested was estimated at -0.25 tCO₂eq euro⁻¹ and -0.41 tCO₂eq euro⁻¹ (or 4 to 2.5 euros tCO₂eq⁻¹) under scenarios 1 and 2. Agricultural production and farmers’ cash flow increased over the course of 20 years. This study highlighted the potential of agroecological practices to improve the productivity and profitability of smallholder farming systems, while contributing to climate change mitigation. The findings should fuel current international discussions on the relevance of family farming in the climate change mitigation agenda.

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