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Reuse of Pineapple Residue in Philippine Agriculture: determination of the net ecosystem C balance for a CAM plant in a pot-scale experiment

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The Philippines is one of the world's leading producers of pineapples, wherein production is comprised mostly of small family farms that are less than 2 hectares in size. As by-product, they generate a large amount of plant residues (e.g., crowns and stems) that are commonly left at the edge of the field. This practice releases substantial amount of greenhouse gas (GHG) emissions and neglects the potential value of pineapple residue. Enabling a waste treatment by returning them to the field through incorporation or mulching holds the potential to maintain soil fertility, reduce climate impact, secure yield stability, and achieving a high resource efficiency by closing material cycles locally. It may also increase soil organic carbon stock (SOC) and reduce greenhouse gas (GHG) emissions. To date, however, the knowledge about this is still very sparse.

The rePRISING project aims to demonstrate that returning pineapple residue either through mulching or incorporation to the field may help promote the closing of nutrient-cycles (C/N/P/K) locally, thus helping to increase soil fertility and soil C sequestration, while reducing GHG emissions. Within the project, the recycling of pineapple residue together with various local organic and inorganic amendments will be studied during a two-year field experiment using the manual closed chamber method. The field study will be supplemented by pot-scale greenhouse and incubation experiments, used inter alia to determine baseline GHG emissions and carbon budgets of pineapple cultivation systems and residue treatments.

Here we present first results of a pot experiment performed during winter 2020-2021 used to develop a suitable procedure for the in-situ determination of dynamic net ecosystem C balances (NECB) for pineapple cultivation systems. This will be further utilized for upcoming field study. This is challenging in so far as pineapple plants use the Crassulacean acid metabolism (CAM photosynthesis) and the manual closed chamber method has not yet been applied to determine NECB from CAM plants.

Keywords: nutrient-cycling, carbon sequestration, greenhouse gas (GHG) emissions, pineapple

residue, climate change mitigation