Soil Fertility Replenishment in Africa: an Investment in Natural Resource Capital

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Soil fertility depletion in smallholder farms is the fundamental biophysical root cause for declining per-capita food production in Africa, and soil fertility replenishment should be considered as an investment in natural resource capital. An average of 660 kg N ha\(^{-1}\), 75 kg P ha\(^{-1}\), and 450 kg K ha\(^{-1}\) has been lost during the last 30 years from about 200 million ha of cultivated land in 37 African countries. The consequences are felt at the farm, watershed, national, and global levels. There is an exact congruence between the concepts of capital stocks and service flows in economics and that of nutrient pools and fluxes in soil science. Phosphorus-replenishment strategies are mainly fertilizer-based with biological supplementation, while N replenishment strategies are mainly biological with chemical supplementation. Africa has ample phosphate rock deposits that could be used directly or as superphosphates to reverse P depletion. Decomposing organic inputs produce organic acids that help solubilize phosphate rocks. Agroforestry trees and herbaceous leguminous green manures play a major role in N capture and internal cycling. Accompanying technologies, such as soil conservation are needed to make recapitalization operational. Policy improvements are needed to provide the appropriate fertilizers at a reasonable cost and at the right time; better infrastructure; access to micro credit; timely access to markets; adaptive research and extension education. Soil fertility replenishment was found to be profitable at the farm level in three contrasting case studies, but resource poor farmers lack the capital and access to credit to make the initial investment.

The issue of who should pay for this recapitalization is based on the principle that those who benefit from a course of action should incur the costs of its implementation. Progress to date on soil fertility initiatives throughout Africa will be summarized.

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