

Nutrient Use Efficiency in Agroforestry Systems

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Abstract

Agroforestry can contribute to the solution of a number of problems in the nutrient balance of agro-ecosystems. Tree products with a high economic value per unit nutrient content can reduce the risk of mining the soil without financial possibilities for obtaining external inputs. Trees may also reduce nutrient losses from agro-ecosystems and thus contribute to long term productivity and input use efficiency.

A general approach is given to optimizing agroforestry systems on the basis of tree-soil-crop interactions. Nutrient sources for tree growth can be complementary to those of crops (nutrient pumps and safety nets) or be the same, leading to competition. Soil fertility improvement through tree litter and prunings depends on the quantity, quality, timing and placement. Soil fertility improvement can be most clearly studied in sequential agro-forestry systems. On sloping lands trees can contribute to erosion control, but especially to local deposition of sediment.

1. Different types of agroforestry

Agroforestry is a collective name for land use systems and technologies in which woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately combined on the same land management unit with herbaceous crops and/or animals, either in some form of spatial arrangement or temporal sequence. In agroforestry systems there are both ecological and economic interactions among the different components (Nair, 1993). Trade-offs between productivity of the various components are normally unavoidable, but the combined productivity of a mixed agroforestry system can under certain conditions be higher than that of the best single-component systems.

Figure 1 gives a tentative classification of agroforestry systems, based on the degree of spatial and temporal overlap of the tree and crop components. Systems in the lower left corner do not fall under the definition of agroforestry, as here trees and crops do not interact.