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## Agroforestry for Resilient Agroecosystems in the Mid-Hills of Nepal

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### Abstract

In order to adopt sustainable land use and to improve food security and livelihood, agroforestry systems offer an alternative to traditional farming that can be advantageous in terms of productivity, biodiversity, and ecological services provided.

16 farmers of Kaule, a Nepalese village in the Mid-Hills have changed over from traditional farm management with crop rotation systems to the integration of woody perennials on the same land management units. Poor nutrient conditions and susceptibility to erosion characterise the region's prevalent soils. The agroforestry farmers have taken different measures to enhance the soil fertility, such as the use of green manure. The Nepali-German organisation Kaule e.V. supports the adoption of agroforestry systems in Kaule. In the context of scientific documentation and evaluation of this project the study's objective is to compare soil properties and phytodiversity of: A) 15 years ago established agroforestry land, B) 2 years ago established agroforestry land, and C) conventional crop rotation land.

Soil samples (n=96) were taken at 24 terraces (8 per land type) and analysed. The fields' crops, shrubs and trees were examined by stratified random sampling. The survey included soil and vegetation parameters of field boundaries — in general the terrace risers.

Analysis of variance shows significant ( $p < 0.05$ , ANOVA / Kruskal-Wallis test) differences of agroforestry land (A) and conventional land (C) in terms of plant diversity, plant cover, and soil parameters. Soils of agroforestry land provide more favourable conditions for plant growth *e.g.* concerning pH, total C, total N, CEC, and exchangeable Al, Ca, and Mg. Although the transition process to agroforestry has been in progress for only 2 years in 'B', soil parameters already reflect the shift to restoring farm soil fertility. Terrace risers' soil parameters are not correlated with management.

Species richness of agroforestry lands' tree and shrub layers is higher compared to conventional lands'. Transition lands'  $\alpha$ - and  $\beta$ -diversity indices have reached values of agroforestry land within two years since conversion has started.

In conclusion, agroforestry in the Nepalese Mid-Hills provides ecological and economic benefits and is a viable option to develop more efficient, more resilient and sustainable land use systems.

**Keywords:** Agroforestry, Mid-Hills, Nepal, phytodiversity, soil fertility

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