An economic analysis of a simulated alley cropping system for semi-arid conditions, using micro computers

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Introduction

The number of experiments with Leucaena leucocephala (common name leucaena) mulch to add nutrients to the soil is gradually increasing. Usually, leucaena is grown in hedges between annual crops and lopped regularly to provide a leafy mulch for the crops grown in the alleys.

Fuelwood is reported as a by-product of such a land-use system, i.e. the woody stems of the leucaena are collected from the fields after the leaves and twigs have been shed or removed.

Torres (1983) reviewed some of the literature on this research and estimated that, on average, about 45 grams of organic N is produced meter\(^{-1}\) of hedgerow year\(^{-1}\) in the lowland humid tropics and maize production increased by about 5 to 16 kgs for each kg of organic N added.

These results are rather promising; however, so far, very few such experiments have been conducted for the semi-arid regions, where potential biomass production, and therefore nutrient production from leucaena hedgerows, is much lower. Some data are therefore simulated for an ex ante analysis of this land-use system for the semi-arid areas in Machakos District, Kenya where rainfall is bimodal and averages about 600 mm year\(^{-1}\).

MULBUD, a micro computer program for agroforestry systems, has been used for the simulations and analyses. Since the program is still under development, some printouts had to be amended to facilitate their reading.

Assumptions

To analyse whether or not it is beneficial for a farmer to adopt a leucaena alley cropping system, a comparison of the farmer's returns in the with and without hedgerow situation is required.

In this analysis, it will be assumed that the existing land use will form the basis for the without hedgerow situation. The application of artificial fertilizers as an alternative non-agroforestry technology has not been considered because of its rather high cash requirements as well as the inadequate input supply infrastructure in the area.
Traditionally, maize and beans have been intercropped twice a year in most of the semi-arid areas of Machakos District. Yields fluctuate from one season to the next, as well as from one year to the next, mainly because of low and erratic rainfall. The average seasonal yield is estimated at around 800 kgs of maize and 200 kgs of beans hectare⁻¹. It is assumed that these yields will not decline much further, since the nutrient status of the soil as well as the organic matter content are already at a very low level.

The introduction of a leucaena alley cropping system within the maize and beans field will reduce the area available for cropping. The land lost for annual crops depends on the spacing between the hedgerows as well as the width of such rows. Torres’ paper indicates that within certain limits, a