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Agro-Forestry: A Sustainable Cropping Option for Uplands in Western Thailand

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Abstract

In Western Thailand, maize production is mainly carried out on uplands and freshly cleared forests, which is not only reducing the forest area but also soil fertility. The fertility of land reduces over time due to many factors such as losses of fertile top soil due to lack of proper soil cover, low fertiliser inputs, intensive and inappropriate land use. We tested various maize based soil conservation options including alley cropping. A 2-year-data set with maize farmers' practice (monocropping, tillage), maize-chili-hedgerow intercropping (\pm fertilisation; minimum tillage) was used to assess the sustainability of these systems by using the Water Nutrient and Light Capture in Agroforestry Systems (WaNuLCAS) model. After calibration and validation, WaNuLCAS was used to (i) predict production sustainability of maize based agroforestry systems, (ii) improve our understanding of trees' impact on crops in alley cropping, and (iii) identify mitigation strategies for future land use. WaNuLCAS was used to run for five years continuous cropping seasons with the same practices as were used in the field experiments during 2010 and 2011. Total dry matter simulations over a period of five years showed that agroforestry systems are very sustainable production systems on uplands with only 19% decrease as compared to farmer practice with 50% decrease from baseline. Model evaluated options to overcome the nutrient limitation at the crop-soil-hedge interface suggested small additional amounts of fertiliser application just at crop rows planted close to hedgerows, while keeping standard amount of fertiliser in crop rows distant to the hedgerows. This helped sustaining total maize biomass yields up to 1.8 kg m^{-2} . Such strategic management options can be adopted by the local farmers' fostering soil conservation systems for sustainable agroforestry production systems in future, which will directly decrease pressure on uplands due to deforestation.

Keywords: Agroforestry, hedgerows, maize, Thailand, uplands, WaNuLCAS