Assessing Intercropping Strategies for Smallholder Rubber Plantations in Northern Thailand using the WaNuLCAS Model

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Abstract

Thailand is the largest producer of natural rubber in the world with a production of about 3.35 million tons in 2010. More than 90 percent of rubber is grown by smallholders. Recently, the establishment of new rubber plantations has been promoted especially in the North (4.7 % of total rubber planting areas) and Northeast (11.9 % of total rubber planting areas) of Thailand. Farmers in the northern parts of Thailand nowadays replace short-term cash crops by monoculture rubber plantations, although these areas have less favourable growing conditions. Hence, rubber plantations competing with food crops may affect rural livelihood, environmental services and food security. Therefore, this study aims to evaluate and understand the impact of crop management based on intercropping scenarios and minimum of competition among associated crops. The intention is to reduce pressure on natural resources and develop sustainable production systems with economic options for smallholder. The Water, Nutrient, Light Capture in Agroforestry Systems (WaNuLCAS) model was used to predict crop and rubber productivity under various management scenarios of intercropping and monocropping in the Phitsanulok province (16°55' N, 100°32' E), one of the 17 northern provinces of Thailand. Annual precipitation is about 1200 mm. Model scenarios were simulated for rubber (clon RRIM600) spacing of 2.5 m × 7 m, 3 m × 7 m and 3 m × 8 m under sole cropping and intercrop with maize and upland rice. The yield of maize and rice is significantly influenced by rubber-tree spacing in the intercropping systems. Rubber intercrop with maize or upland rice with recommended chemical fertiliser plus organic input together with pruning was the best way to mitigate competition between rubber and crop. In long term, rubber tree diameter and wood volume of sole cropping are higher than rubber intercropped systems. With higher rubber tree density, the rubber tree diameter increases slower. WaNuLCAS model can be used as a tool to support knowledge relating to land use and decision-making for the benefit of smallholder rubber plantation in northern Thailand.

Keywords: Intercropping practice, rubber, smallholder, WaNuLCAS model

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