ABSTRACT

TRIADIATI. Function of Some Ecosystem Components at Natural Forest and Cacao Agroforestry Systems at the Margin of Lore Lindu National Park, Central Sulawesi. Under direction of SUKISMAN TJITROSEMITO, EDI GUHARDJA, SUDARSONO, IBNUL QAYIM

Cacao agroforestry is a traditional form of agriculture practiced by the people of Central Sulawesi. These agroforestry systems vary from a simple system, following selective cutting of forest trees, to a more sophisticated planting design. The aims of this research were (1) to determine litterfall dynamics, leaf-litter decomposition, and fine root biomass, (2) to determine active fraction on soil macro-organic matter (SOM) in natural forest and cacao agroforestry systems, and (3) to assess nitrogen resorption and nitrogen use efficiency (N NUE) and implication for cacao establishment.

The field studies were conducted in three types of cacao agroforestry systems at the northeastern margin of Lore Lindu National Park (LLNP). Field study sites covering in natural forest (NF) and in three cacao agroforestry systems that is cacao was planted under remaining forest cover (CF1), under planted trees (CF2), and between shade trees Gliricidia sepium (CP). The parameters are nitrogen soil content, fine root biomass, soil macro-organic matter by size and density fractionation, soil surface organic layer by quadrant, litterfall production by litter trap, and rate of decomposition by litter bag, nitrogen use efficiency in cacao plant and ecosystem scale, and nitrogen resorption.

The results shown that the greatest litterfall production was recorded in the NF with the fastest rate of decomposition. Among cacao agroforestry systems, the produced the greatest litterfall, but the rate of decomposition was lower than that of the CF1. Leaf-litter was predominant litter component compared to the other components (woody litter and reproductive parts) in all study sites. The monthly litterfall in NF and cacao agroforestry systems were influenced by climate. The rate of leaf-litter decomposition was done in two periods, which revealed a different pattern. Fine roots biomass in the natural forest was higher than those of cacao agroforestry systems. Fractionation of soil macro-organic matter resulted three fractions with the order of total fractions as followed intermediate fraction (MF) > heavy fraction (HF) > light fraction/active fraction (LF). The percentage of LF in the natural forest was lower than those of in the cacao agroforestry systems. The organic and nitrogen content in the LF in the natural forest was higher than those of cacao agroforestry systems. Among cacao agroforestry system, the organic and nitrogen content in the LF was the highest in the CF2. The dry weight of SOM was influenced by amount of litterfall and rate of decomposition. Nitrogen resorption and nitrogen use efficiency in cacao plant (N NUE) were not significantly different among three cacao agroforestry systems. Nitrogen use efficiency in four different ecosystems (N NUE) showed that ecosystem CP was significantly lower than those the three ecosystems.

It can be concluded that land use change from natural forest to cacao agroforestry systems would influence ecosystem function. Cacao agroforestry systems under CF1 and CF2 are able to maintain ecology performance and diversity similar to natural forest.

Key words: cacao agroforestry, litterfall, decomposition, soil macro-organic matter, nitrogen resorption, nitrogen use efficiency.