CHAPTER 19

ARE TROPICAL HOMEGARDENS SUSTAINABLE? SOME EVIDENCE FROM CENTRAL SULAWESI, INDONESIA

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Keywords: Biodiversity, In situ conservation, Soil fertility, Sustainability indicators, Vegetation dynamics.

Abstract. Homegardens are regarded as sustainable agricultural production systems, although support for this statement by quantitative data has been rare. Out of the suggested indicators/descriptors for assessing sustainability, plant diversity has been frequently studied. However, species diversity is not static; it varies with time and according to ecological and socioeconomic factors and/or characteristics of the gardens and gardeners. In order to evaluate sustainability of the homegarden system, we assessed soil fertility parameters and changes in diversity of useful plants over time during 2001 – 2004 in 30 homegardens from three villages adjacent to the Lore Lindu National Park in Central Sulawesi, Indonesia. Soil carbon (C) and nitrogen (N) contents decreased over time. In large gardens with different production zones, soil of vegetable zones contained less C and N than that of cacao (Theobroma cacao) zones. Richness of useful plant species was high and increased over time, from 149 species in 2001 to 168 in 2003. Species composition of homegardens from one village, mainly inhabited by migrants, contrasted strongly with those from the other two, inhabited by native farmers. Diversity of useful plants was lower in the migrant village, where soil fertility was low, too. Plant diversity appeared to be influenced to varying extent by a combination of factors such as garden size/age, soil fertility, ethnicity and age of gardener, and market access. The surveyed homegardens did not seem to be managed appropriately to ensure sustainability in terms of soil fertility although they had a high diversity of useful plants.

1. INTRODUCTION

Tropical homegardens are generally regarded as sustainable production systems (Christanty, 1990; Landauer and Brazil, 1990; Soemarwoto and Conway, 1991;...
Torquebiau, 1992; Abdoellah et al., 2001; Kumar and Nair, 2004). However, quantitative support for this statement is mostly lacking, particularly because of the difficulties in measuring sustainability (Kumar and Nair, 2004). Therefore, researchers rely on indirect evidences using certain sustainability descriptors and/or indicators (Torquebiau, 1992; Huxley, 1999).

Among the available indicators, perhaps the criterion most used in homegarden research is biodiversity, particularly plant species diversity. The wide spectrum of useful plants creates a multilayered vegetation structure in homegardens, which is responsible for many benefits and advantages of the system. This diversity results in favorable microclimate, reduced risk of pests and diseases, efficient use of resources, year-round availability of products, and soil fertility maintenance. Thus, plant diversity is considered as contributing substantially to the sustainability of the system (Soemarwoto and Conway, 1991; Torquebiau, 1992).

Because of their diversity, homegardens are also regarded as an ideal production system for in situ conservation of plant genetic resources (Watson and Eyzaguirre, 2002), crucial for long-term sustainability. However, crop diversity is influenced by different factors such as size and age of homegardens or age of gardeners (Abdoellah et al., 2001; Gutiérrez et al., 2004). Besides, environmental and socioeconomic characteristics are known to influence homegarden diversity (Michon and Mary, 1994; Wezel and Bender, 2003; Gutiérrez et al., 2004). Nevertheless, the suitability of biodiversity as a sustainability indicator needs to be critically examined because there is no threshold value for an ideal number of species in a sustainable system. In addition, diversity seems to be highly variable over time, and the homegarden research so far has neglected to quantify such changes.

Another sustainability indicator generally accepted is soil fertility (Torquebiau, 1992; Huxley, 1999; Kumar and Nair, 2004). In homegardens, soil fertility is said to be maintained due to the closed nutrient cycling and low nutrient-export through harvested products (Gajaseni and Gajaseni, 1999; Kumar and Nair, 2004). Dense layers of litter and undergrowth are supposed to prevent or at least reduce soil erosion in homegardens (Karyono, 1990; Soemarwoto and Conway, 1991). Investigation of soil fertility parameters is common in homegarden research (Jensen, 1993; Gajaseni and Gajaseni, 1999), whereas soil erosion has rarely been assessed (Torquebiau, 1992). Usually, statements on sustainable soil fertility management in homegardens are supported only by a single ‘snapshot’ of the status quo without any further consideration on soil fertility variation over space and time. The role of different management practices leading to this variation in the long-term is not sufficiently investigated.

In association with the multidisciplinary German-Indonesian collaborative research program STORMA (Stability of Rainforest Margins in Indonesia, SFB 552), this study aimed at assessing the sustainability of selected homegardens on the island of Sulawesi with the help of selected sustainability indicators. A first assessment from a comprehensive dataset is presented here, focusing on aspects of:

- Stability/dynamics in diversity of useful plants over time
- Changes in soil fertility over time