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## Soil Microbial Communities and Activities under Intensive Organic and Conventional Vegetable Farming in West Java, Indonesia

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### Abstract

Throughout tropical Asia vegetables are overfertilised and even more serious is pesticide overuse in the region. Organic farming methods, however, increasingly receive attention. How production methods influence the microbial community in tropical soils remains almost unexplored. In 2007 and 2008 soil microbiology was examined on three organic vegetable farms in humid tropical West Java. At one organic farm a distinction was made between plots cultivated organically for more than 20 years and plots converted from conventional management in 2005. In 2008 an organically managed field since July 2008 was included in the study. The organic farms were compared with conventional fields in their vicinity. We measured PLFA composition, and dehydrogenase and  $\beta$ -glucosidase activity. In July 2007 enzyme activity, especially dehydrogenase activity, was strongly depressed under conventional management compared to the organic fields. Dehydrogenase activity was 3.8 to 6.4 times higher on organic fields compared to conventional fields, while  $\beta$ -glucosidase activity was 1.6 to 2.9 times higher. In September and July 2008 differences in enzyme activity between organic and conventional production were less pronounced: dehydrogenase activity ratios ranged between 1.2 and 2.8, and the  $\beta$ -glucosidase activity ratios between 1.2 and 2.3. Enzyme activities of the organic field converted in 2008 were comparable to or even higher than on the organic farm in the immediate neighbourhood, probably due to the high initial application of compost (53 Mg ha<sup>-1</sup>). Enzyme activities of the organic fields converted in 2005 were comparable to those of the fields in long-term organic production, in both 2007 and 2008. In September 2008, at the end of the dry season, enzyme activities were significantly lower compared to July 2008 in the middle of the dry season. The composition of the soil microbial community, measured in 2007 by PLFA profiles, clearly differed between conventional and organic farming sites. Particularly C16:1 $\omega$ 5c, marker fatty acid for arbuscular mycorrhizal fungi, appeared to be suited as an indicator of the impact of management on the soil microbial community. The negative impact of intensive chemical fertiliser and pesticide use on soil microbiology will probably affect important soil processes such as carbon and nitrogen cycling.

**Keywords:** Enzyme activity, Indonesia, organic farming, PLFA, soil quality