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“Development on the margin”

## Maintenance of Soil Quality in an Intensive Horticultural System in the Highlands of West Java

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### Abstract

Intensive vegetable production on Andosol soils in the humid highlands of West Java (Indonesia) meets most of the domestic demand for vegetables. Permanent cropping, tight crop rotations and nutrient exports may result in soil degradation if best practice soil fertility management is not used.

To verify this hypothesis, eight farms near Lembang and Pangalengan were surveyed (April to July 2010) for their management practices with soil quality assessed. Farmers were interviewed about their practices and surface soil samples were collected from a range of vegetable beds. Nearby afforested sites, formerly used for vegetable production, were sampled to provide a baseline. The following indicators of soil quality were analysed: organic carbon (OC) (Walkely-Black), total nitrogen (TN) (Kjeldahl), available phosphorus (Bray-II) and bulk density (BD). In addition, soil texture, CEC and pH were analysed, but not presented. Differences between the two land use systems were evaluated by t-test.

According to the interviews, management practices include the use of plastic mulch, large applications of manure (5 t ha<sup>-1</sup> crop), mineral fertiliser (> 100 kg NPK<sub>2</sub>O fertiliser (25.1/12.2/6.5) ha<sup>-1</sup> crop) and the regular application of pesticides.

OC (21.8 %) and TN (0.62 %) are significantly higher in the afforested sites than in the vegetable beds (15 % and 0.47 %). The difference can be explained by the accelerated mineralisation in vegetable beds due to tillage. The extremely high OC values are perhaps the result of protection by organo-metallic associations in these Andosol soils. The incorporation of large amounts of rice husks (C/N ratio > 80) into the manure which is applied may also result in OC concentrations. Due to fertilisation, the amount of available phosphorus is higher in the vegetable beds (38 mg kg<sup>-1</sup>) than in the afforested land (11 mg kg<sup>-1</sup>). BD shows no significant difference between the vegetable (0.73 g cm<sup>-3</sup>) and the afforested land (0.68 g cm<sup>-3</sup>). The construction of raised vegetable beds with large amounts of organic material is proposed as the reason that no differences in BD were found.

This survey showed that high applications of organic amendments and mineral fertilizers resulted in the maintenance of soil fertility, but the wider implications of high input intensive systems are discussed further.

**Keywords:** Horticulture, Indonesia, organic carbon, soil quality