



Tropentag, September 17-19, 2014, Prague, Czech Republic

“Bridging the gap between increasing knowledge and decreasing resources”

## The Vegetation Structure and Effect of Crown Shade to Microclimatic Conditions of Coffee Plantation in Villa Rica, Peru

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### Abstract

Coffee is one of the most important crops cultivated in South America. The aim of this paper is to evaluate a vegetation structure and to assess effect of crown shade on microclimatic conditions of a coffee plantation. The research is placed at a coffee plantation named Ave Fénix (8.35 ha) located at an altitude of 1550 m a.s.l. near the town of Villa Rica, Pasco region, Peru. Microclimatic parameters such as air humidity, air and soil temperature were measured for three years (from January 2011 to January 2014) and a full census of all trees with a crown projection was carried out in 2011.

The amount of shade is expressed by a low frequency moving filter (side 10 m). The resultant map of shade was divided into quartiles and the first one (with less than 25 % of shade) was selected as an area without shading (0.98 ha) and a shaded area (> 25 % of shade; 7.37 ha).

The tree vegetation structure on the shaded area is composed mainly of *Inga* spp. (63.8 t ha<sup>-1</sup>) followed by *Acrocarpus fraxinifolius* (9.8 t ha<sup>-1</sup>) and *Pinus* spp. (7.2 t ha<sup>-1</sup>). The density of coffee shrubs in the shaded area is 6,833 shrubs ha<sup>-1</sup> and 5,327 shrubs ha<sup>-1</sup> in the non-shaded area. The microclimatic conditions in shaded and non-shaded areas are different. The shaded area temperature is less affected by direct sunlight and thus temperature of air and soil is lower than in the non-shaded area. On the other side, higher humidity was observed in places without shade. The results bring better insight into agroforestry systems and deeper understanding of the role of shading.

**Keywords:** Agroforestry, coffee plantations, microclimate, Peru, tree crown cover