



## **The influence of shade trees on coffee quality in small holder AF systems in southern Columbia**

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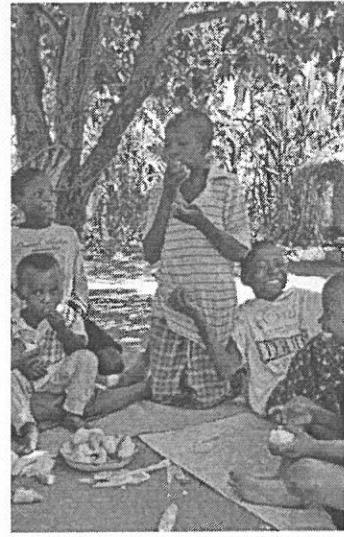
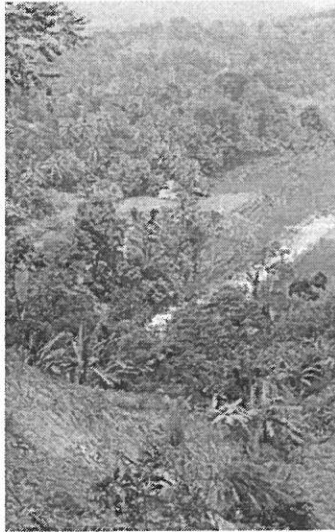
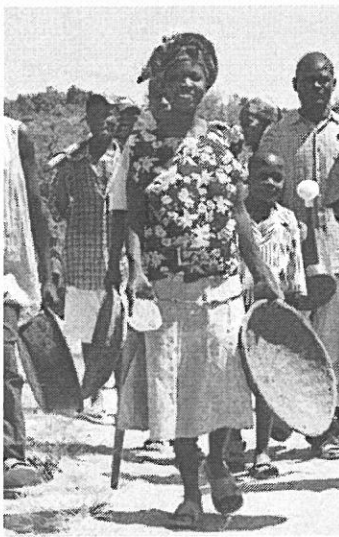
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heterogeneity of these factors, patchiness is the rule in the distribution of plant pests and diseases. Environmental information is now readily available in high resolution and can be combined with spatial analyses to determine potential pest and disease distribution due to environmental factors, and subsequently lead to better decisions and improved risk management. The objective of this paper is to show how better decisions and disease risk-adapted agroforestry practices, for entire coffee growing regions, can be derived based on spatial decision support tools and a minimum of ground data evidence. We used ground data, on coffee pests and diseases, collected in previous surveys conducted in Costa Rican coffee plots within a range of shade density. The diseases retained for our analyses were coffee rust (*Hemileia vastatrix*), American leaf spot disease (*Mycena citricolor*), and coffee blight (*Phoma costarricensis*). We first used the environmental data for the coffee plots with less shade density, and generated for the different diseases the decisive environmental driving factors by means of Geographical Information System (GIS). The climatic data such as radiation, precipitation and temperature are derived on a 1 km resolution. We used algorithms based on maximum entropy, Bayesian statistics, and spatial analysis to delimit areas with distinct risk potential. The results appraise the disease risk of coffee growing areas associated with their physical characteristics. For the areas where the results were significant, the decisive factors for each disease are identified and shade-management strategies are suggested according to their known effect on these factors.

## The influence of shade trees on coffee quality in small holder AF systems in southern Colombia

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**Abstract** Production of coffee, especially by small holders, is often associated with various forms of shade management. To analyse the effects of shade on physical coffee quality and on sensory cup quality of *Coffea arabica* L. cv. Caturra KMC, a study was carried out with 94 plots on 16 farms in 2 municipalities, Timaná and Oporapa, located at elevations from 1272 to 1730 m above sea level in Huila, Colombia. The study was designed with emphasis on shade cover variation within each of the 2 study areas, while minimizing the variability of environment, agronomic management other than shade, and post-harvest processing. Forty-six samples of shade coffee and 46 samples of sun coffee were evaluated for physical and sensory attributes using 3 professional coffee cuppers (assessors). A principal component analysis including all quality and environmental variables showed that sensory attributes were influenced negatively by shade, and that physical attributes were influenced positively by altitude. A mixed linear model, with coffee cupper and farm as random variables, revealed different shade effects on coffee quality in the 2 areas. In Oporapa, situated at high altitudes, shade had a negative effect on fragrance, acidity, body, sweetness and preference of the beverage, while no effect was found on the physical quality. In Timaná, situated at lower altitudes, shade did not have a significant effect on sensorial attributes, but significantly reduced the number of small beans. At high altitudes with low temperatures and no nutrient or water deficits, shade trees may thus have a partly adverse effect on *C. arabica* cv. Caturra resulting in reduced sensory quality. The occurrence of berry borer (*Hypothenemus hampei*) was lower at high altitudes and higher under shade. Further shade effects were assessed, such as influence on coffee plant health, though not quantitatively. The results led to immediate benefits to some farmers through improved marketing.