



# 4th World Congress on Agroforestry

20-22 May 2019  
Montpellier, France

## Book of Abstracts



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Edited by Christian Dupraz, Marie Gosme and Gerry Lawson with  
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- MIHĂILĂ Elena - Voluntari, Romania: Shelterbelts for crop protection as the main type of agroforestry system in Romania
- BA Ousseynou - Dakar, Senegal: Valorisation of salty soils by using phosphogypsum and peanut shell on growth of 3 forest trees under salt conditions
- SAKAI Yuji - Hachioji-shi, Japan: Afforestation and agricultural production through salt-affected soil amelioration with coal bio-briquette ash in China

11:00 AM

**Room Joffre A (level 1)****L12.1 - Economics of agroforestry: the link between nature and society**

Chairs: Michael Jacobson &amp; Nathalie Cialdella

*Regular talks*

- FAYE MANE Ndeye Fatou - Dakar, Senegal: Planting trees to increase food security? The case study of the groundnut basin of Senegal
- MAKOVSKIS Kristaps - Salaspis, Latvia: Different tree specie and management system economics as buffer zones in Baltic climate conditions
- SMITH Joanne - Newbury, United Kingdom: Making hedgerows pay their way: the economics of harvesting hedges for bioenergy
- PADOVAN Maria Penha - Vitoria, Brazil: Dealing with financial constraints in a complex agroforestry system in the Brazilian rainforest
- PARROT Laurent - Montpellier, France: The Alliance Approach to Innovation in agro-forestry: Agro-ecological innovations, Alliance, and Agency

11:00 AM

**Room Joffre B (level 1)****L18 - Cereals and annual crops in agroforestry**

Chairs: Shibu Jose, Delphine Mézière &amp; Andrea Vityi

*Regular talks*

- FALL Dioumacor - Bambey, Senegal: Importance and trees management of Senegalia senegal on soil fertility and yield of associated crops in northern Senegal
- PONTES Laíse - Ponta Grossa, Brazil: Corn yield in different integrated crop-livestock systems: the effect of shade
- BÉRAL Camille - Anduze, France: Agroforestry impacts tomatoes production in a vegetable organic alley cropping temperate system
- HODGE Kim - Regina, Canada: Measuring impact of shelterbelts on canola yield in the Canadian Prairies
- TEMANI Fida - Montpellier, France: Effect of water gradient on the intensity of competition and productivity of annual crops intercropped with olive trees

11:00 AM

**Room Joffre C (level 1)****L22 - Agroforestry: pests, diseases and weeds**

Chairs: Jacques Avelino &amp; Rolando Cerda

*Regular talks*

- CERDA Rolando - Turrialba, Costa Rica: Coffee agroforestry systems that reduce crop losses due to pests and diseases, while providing ecosystem services
- AVELINO Jacques - Turrialba, Costa Rica: Shade effects on coffee rust (*Hemileia vastatrix*)
- SCHNEIDER Monika - Frick, Switzerland: Do cacao agroforestry systems increase pest and disease incidence? Evidences from a long-term system comparison trial
- ALWORA Getrude - Ruiru, Kenya: Shade and leaf retention: an aspect of effective Coffee Leaf Rust management
- AKOUTOU MVONDO Etienne - Yaoundé, Cameroon: Effects of complex cocoa-based agroforests on Citrus trees dieback



### Shade effects on coffee rust (*Hemileia vastatrix*)

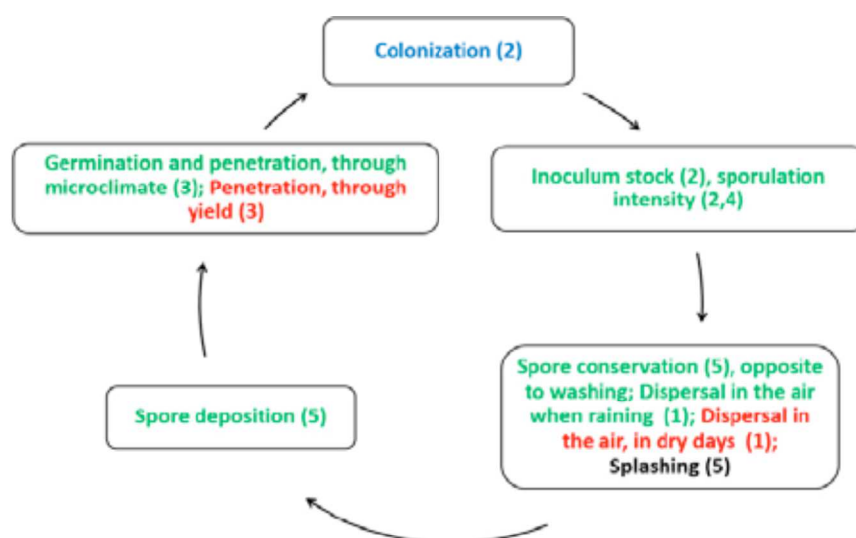
Avelino J.<sup>1</sup> (jacques.avelino@cirad.fr), Badaroux J.<sup>2</sup>, Boudrot A.<sup>1</sup>, Brenes A.<sup>2</sup>, Granados E.<sup>3</sup>, Henrion M.<sup>2</sup>, López D.<sup>2</sup>, Merle I.<sup>1</sup>, Pico J.<sup>2</sup>, Segura B.<sup>2</sup>, Vélchez S.<sup>2</sup>, Smith M.<sup>4</sup>, de Melo E.<sup>2</sup>

<sup>1</sup>UPR 106, CIRAD, Turrialba, Costa Rica; <sup>2</sup>CATIE, Turrialba, Costa Rica; <sup>3</sup>Sede del Atlántico, UCR, Turrialba, Costa Rica; <sup>4</sup>WCR, Portland, Oregon, USA

To better understand shade effects on coffee rust (*Hemileia vastatrix*), we studied pathogen dispersal, deposition, germination, penetration, colonization and sporulation under shade and full sun conditions (Figure). Studies were conducted from 2008 in the CATIE agroforestry system long term trial, at Turrialba, Costa Rica, at 600 m of altitude.

Shade had a preponderant and unwished effect on spore conservation during rains. At full sun, spores were washed from the leaves to the ground more easily. An average loss of 69 spores cm<sup>-2</sup> of ground, at full sun, was estimated after a rainy day, under coffee trees, while under shade, only 52 spores cm<sup>-2</sup> were lost, despite inoculum stock being on average about 25 638 spores per coffee tree branch at full sun and 63 579 spores under shade. The reduction of the inoculum stock by rains was therefore 3.3 times higher at full sun as compared to shade. This can be explained by the interception of rainwater by shade trees. As lost spores cannot contribute to the growth of the epidemic, this effect seems to be one of the most relevant effects favoring rust under shade.

Shade is necessary to cope with climate change in coffee systems. Many of the negative effects of shade have to do with the interception of rainwater (reduced throughfall water and also higher raindrop kinetic energy). Shade tree functional traits or management systems that allow to increase throughfall water in coffee plots would be of great interest to manage rust.



Shade effects on coffee rust; green: shade improves; red: sun improves; blue: no difference between shade and sun; black: the mechanism seems secondary; numbers are for references

**Keywords:** Dispersal, Inoculum stock, Throughfall kinetic energy, Raindrop interception, Spore washoff.

References:

1. Boudrot et al. 2016. Phytopathology 106: 572-80. 10.1094/PHYTO-02-15-0058-R
2. Brenes Loaiza 2017. Master Thesis. CATIE, Turrialba, Costa Rica. 51 pp.
3. Lopez-Bravo et al. 2012. Crop Protection 38: 21-29. 10.1016/j.cropro.2012.03.011
4. Pico Rosado 2014. Master Thesis. CATIE, Turrialba, Costa Rica. 79 pp.
5. Segura Escobar 2017. Master Thesis. CATIE, Turrialba, Costa Rica. 51 pp.