

UR FPEP

Functioning and management of tree-based planted ecosystems (Fonctionnement et pilotage des écosystèmes de plantations)

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Research area

The **Functioning and Management of Tree-based Planted Ecosystems Unit** (FPEP) aims at ensuring a sustained and sustainable production of these ecosystems through the use of their functions and the interactions between these functions. The objective of the research is the characterisation and formalisation of water, carbon and mineral functioning using an ecosystem approach to describe the plant-soil-climate relationships. Specific research questions are relative to the impact of climate and crop management on ecosystem evapotranspiration, water transfer in the soil, photosynthesis and assimilate allocation within plant, phenology, biological soil functioning, and nutrient fluxes within the ecosystems studied (oil palm, rubber tree and eucalyptus plantations and agroforestry systems based on coffee or gum trees).

Website: http://www.cirad.fr/ur/ecosystemes_plantations

Research highlights

- Nutrient, carbon and water budgets in eucalyptus plantations (Congo, Brazil)
- Nitrogen, carbon and water cycle in coffee agroforestry systems (Central America, India)
- Impact of tapping systems of rubber trees on carbohydrates allocation and rubber production (Thailand)
- Carbon and water cycles in rubber tree plantations (Thailand)
- Oil palm phenology (Indonesia)
- Symbiotic and heterotrophic microbial soil functioning

Staff profile

	Total permanent staff	Total Scientists*	Scientists with "HDR" ¹	Post-doc fellows	PhD students
Staff	15	14	-	1	14

*Scientists per member institution: 14 CIRAD

Research teams

Research projects are structured according to the ecosystems studied: Eucalyptus, rubber-trees, oil-palm trees, coffee agroforestry systems, gum-tree agroforestry systems

Platforms and other tools

- Nutrient cycle study designs (lysimeters, TDR...); eddy correlation tower ; soil respiration (Li-Cor 8100...) and ecophysiological parameters measurements (Li-Cor 6400 ...)
- Models: , Soil/Vegetation/Atmosphere Transfers (SVAT) models for eucalyptus, coffee-trees, and rubber trees ; growth and yield models (forest plantations) ; taper and biomass equations (forest trees, rubber trees) ; models for nutrient leaching (eucalyptus, coffee agroforestry systems) ; model for N₂O emission (coffee agroforestry systems).
- Database on carbon sequestration (soil and biomass) in eucalyptus and coffee agroforestry systems
- Double Cut Alternative (DCA) tapping system for rubber tree farmers

¹ French university degree for confirmed thesis supervisor

- Isotopic probe for biomass allocation study in oil palm.
- Bio-indicators for ecosystem functioning (C and N cycles).

International Partnerships

University of Sao Paulo (Brazil), UR2PI (Congo), Kasetsart University (Thailand), Bangalore University (India), Catie (Costa-Rica), Tsbf-Ciat (Kenya), Cifor (Indonesia), TUM Munich (Germany) Tuscia University (Italia), CEH (UK),

Facts and figures

Publications in international ranking journals

- ❖ March 2008: 10
- ❖ 2007: 11
- ❖ 2006: 11
- ❖ 2005: 14

Representative publications

Harmand J.M., Avila H., Dambrine E., Skiba U., Oliver R., de Miguel Magaña S., Renderos Durán RV., Jiménez F., Beer J., 2007. Nitrogen dynamics and soil nitrate retention in a *Coffea arabica* - *Eucalyptus deglupta* agroforestry system in Southern Costa Rica. *Biogeochemistry*, 85 (2): 125-139

Laclau J.P., Ranger J., Deleporte P., Nouvellon Y., Saint-André L., Marlet S., Bouillet J.P., 2005. Nutrient cycling in a clonal stand of Eucalyptus and an adjacent savanna ecosystem in Congo. 3 Input-output budgets and consequences for the sustainability of the plantations. *Forest Ecology and Management*, 210, 375-391

Lesueur D., Duponnois R., 2005. Relations between rhizobial nodulation and root colonization of *Acacia crassicarpa* provenances by an arbuscular mycorrhizal fungus, *Glomus intraradices* Schenk and Smith or an ectomycorrhizal fungus, *Pisolithus tinctorius* Coker & Couch. *Ann. Forest Sciences* 62, 467-474

Marsden C., Nouvellon Y., Thongo M'Bou A., Saint-André L., Jourdan C., Kinana A., Epron D., 2008. Two independent estimations of stand-level root respiration on clonal Eucalyptus stands in Congo: up scaling of direct measurements on roots versus the trenched-plot technique. *New Phytologist*, 177 (3): 676-687

Silpi U., Lacoïnte A., Kasemsap P., Thanisawanyangkura S., Chantuma P., Gohet E., Musigamart N., Clément A., Améglio T., Thaler P., 2007. Carbohydrate reserves as a competing sink: evidence from tapping rubber trees. *Tree Physiology*. 27, 881-889

Total annual budget

	2006	2007
Total annual budget (k€- including salaries)	1809	2053
External contracts (k€):	273	579
ANR		20
EU	67	301
Private sector	174	213
Others	32	45