

## Research Group: Management of Soil Fertility and Organic Matter

Department of Natural Products, Plant Biology and Soil Science. Universitat de Barcelona, Avda Joan XXIII s/n, E-08028 Barcelona. Tel: 93 402 44 94, Fax: 93 402 44 95



Joan Romanyà. Professor. E-mail: [jromanya@ub.edu](mailto:jromanya@ub.edu)

### Research line

#### **Soil fertility in agricultural and forest ecosystems. Soil Biogeochemistry. Plant and soil relationships.**

We study short and mid-long term variability of **soil quality** as affected by the soil **use** and **management**. This includes **organic farming practices** (<http://www.ub.es/agroecologia/agroecomed/en/linial.htm>) as well as **afforestation** and **natural regeneration** in **land set aside** and/or after **fire**. We address the soil quality issue mainly from studying the **nutrient cycling** and **soil organic matter**.

Soil nutrient availability plays a key role regulating both plant productivity and soil organic matter storage. In degraded soils and in dry or semiarid conditions the enhancement of plant productivity and the management of **organic residues** can be a key factor to prevent soil organic matter from falling beyond the soil function **thresholds** and thus avoid **soil degradation**.

Currently we focus in:

1. Determining soil fertility variation in dryland extensive grassy crops as affected by different management models (conventional and organic) and in different contexts of exogenous organic matter application (manures and compost).
2. Carbon distribution in Alpine grasslands; relationships with climate, topography and livestock pressure.
3. Determine the relationships between soil organic matter and soil nutrient availability (mainly N and P) with N<sub>2</sub> fixation in Mediterranean rain-fed grassy crops.
4. Determine soil organic C temporal variability in Mediterranean grasslands and shrublands and the role of soil organic C on the stabilisation of the N pools released by fire.

## Projects

**Balangeis** - Capacidad de secuestro de carbono de los suelos españoles: Respuesta a los cambios de uso del suelo, a las prácticas de manejo y a las perturbaciones. (SUM2006-00030-CO2-02 ). Duration 2007-2009.

Principal Investigator: Joan Romanyà.

**Red-bio** - Reseau d'experimentation, d'echange et de transfert pour le developpement de l'agriculture biologique en productions vegetales à destination des agriculteurs catalans. Intereg project. Duration : 2009-2011. Principal Investigator: Lourdes Chamorro.

**Agroeco** - Calidad medioambiental de los agroecosistemas herbáceos extensivos de secano mediterráneos. Desarrollo de métodos para la conservación de la biodiversidad y la mejora de la calidad del suelo (CGL2006-13190-CO3-01). Duration: 2006-2009. Principal Investigator: Xavier Sans.

**Agroecosystems** – Ecologia de sistemes agrícoles. GRE Generalitat de Catalunya. Periode. 2009-20013. Principal Investigator: Xavier Sans

**BurnOut** - Greenhouse gas budget of soils under changing climate and land use Cost Action 639. Duration: 2006-2009 Coordinator: Robert Jandl.

<http://bfw.ac.at/rz/bfwcms.web?dok=5906>

Belowground carbon turnover in European forests. Cost Action-FP0803. Periode 2009-2013. Coordinador: Ivano Brunner.

**Graccie**. Pluridisciplinary Research Team on Abrupt and Gradual Climate Changes and on its environmental effects. Duración: 2008-2012. Coordinador: Joan Grimalt (Programa consolider-ingenio N° 22422).

**Carboinvent** - Multi-source inventory methods for quantifying carbon stocks and stock changes in European forests. (EVK2-CT-2002-00157). Duration: 1/12/2003 - 31/12/2004. Principal Investigator (subcontract UB): Joan Romanyà

**Carbopas** - Balance de carbono en los ecosistemas pastorales de Cataluña. (REN2002-04300-CO2-02/GLO). Duration: 1/10/2002 - 31/09/2005 Principal Investigator: M<sup>a</sup> Teresa Sebastià

Evaluación y capacidad de acumulación de carbono en los suelos del área mediterránea. Agreement between the Spanish Environment Ministry and the University of Barcelona. Duration: 1/12/2002 -31/12/2004. Principal Investigator: V. Ramon Vallejo

## PhD research under way

Title: Soil carbon dynamics in mountain grasslands.

Jordi García Pausas (Inscribed at the UdL)

Title: C and N dynamics in Mediterranean grasslands and shrublands.

Mireia Martí i Roura (Inscribed at the UB)

Title: Regulation of the N fixation in extensive organic grassy crops.

Miriam Burriel i Bosch (Inscribed at the UB)

## Teaching

Undergraduate teaching

- Environmental management
- Soil science

Postgraduate teaching

- Soil fertility in organic farming  
<http://www.ub.es/agroecologia/masterab/>
- Soil plant relationships  
[http://www.uib.es/vpostgrau/bio\\_plantes/index.html](http://www.uib.es/vpostgrau/bio_plantes/index.html)
- Soil ecology  
<http://www.magsa.udl.cat/>
- The use and management of residues in the soil  
<http://www.magsa.udl.cat/>
- Perturbations and soil rehabilitation  
<http://www.magsa.udl.cat/>

## Most relevant publications

Romanyà J., Rovira P. 2009. Organic and inorganic P reserves in rain-fed and irrigated calcareous soils under long-term organic and conventional agriculture.

*Geoderma* 151: 378-386. Doi. 10.1016.

Garcia-Pausas J., Casals P., Camarero L., Huguet C., Thompson R., Sebastià M.T., Romanyà J. 2008. Factors regulating carbon mineralisation in the surface and subsurface soils of Pyrenean mountain grasslands. *Soil Biology and Biochemistry* 40: 2803-2810.

Serrasolses I., Romanyà J., Khanna P.K. 2008. Effects of heating and autoclaving on sorption and desorption of phosphorus in some forest soils. *Biology and Fertility of Soils*. 44 (8): 1063-1072. DOI 10.1007/s00374-008-0301-7

Romanyà J., Rovira P. 2007. Labile phosphorus forms in irrigated and rainfed semiarid Mediterranean grassy crops with long-term organic or conventional farming

- practices. *European Journal of Agronomy* 27: 62-71.  
<http://dx.doi.org/10.1016/j.eja.2007.02.001>
- Garcia-Pausas, J., Casals P., Camarero Ll., Huguet C., Sebastià M<sup>a</sup> T., Thompson R., Romanyà J. 2007. Soil organic carbon storage in mountain grasslands of the Pyrenees: effects of climate and topography. *Biogeochemistry* 82: 279-289.
- Romanyà, J., Rovira, P. 2008. N availability after long-term organic farming in irrigated and rain-fed Mediterranean semi-arid grassy crops. In: (Neuhoff D. et al Eds.). **Cultivate the Future Based on Science**. Volume 1. **Organic Crop Production**. 16 IFOAM Organic World Congress, Modena, Italy, June 16-20, 2008. pages 224-228. Archived at <http://orprints.org/view/projects/conference.html>.
- Romanyà J., Rovira P., Vallejo R. 2007. Análisis del carbono en los suelos agrícolas de España. Aspectos relevantes en relación a la reconversión a la agricultura ecológica en el ámbito mediterráneo. *Ecosistemas*. 2007/1  
 (URL: [http://www.revistaecosistemas.net/articulo.asp?Id=465&Id\\_Categoria=2&tipo=portada](http://www.revistaecosistemas.net/articulo.asp?Id=465&Id_Categoria=2&tipo=portada))
- Milà i Canals Ll., Romanyà J., Cowell S. 2007. Method for assessing impacts on life support functions (LSF) related to the use of 'fertile land' in Life Cycle Assessment (LCA). *Journal of Cleaner Production*: 15: 1426-1440.
- Kurz-Besson C., M.M. Coûteaux, B. Berg, J. Remacle, C. Ribeiro, J. Romanyà, J., M. Thiéry 2006. A climate response function explaining most of the variation of the forest floor needle mass and the needle litter mass loss in pine forests across Europe. *Plant and Soil* 285: 97-114.
- Toribio M., Romanyà, J. 2006. Leaching of heavy metals (Cu, Ni and Zn) and organic matter after sewage sludge application to Mediterranean forest soils. *Science of the Total Environment* 363: 11-21.
- Casals P., J. Romanyà & Vallejo V.R. 2005. Short-term Nitrogen fixation by legume seedlings and resprouts after fire in Mediterranean old-fields. *Biogeochemistry* 76: 477-501.
- Romanyà, J., Fons, J., Sauras T., Gutiérrez E., Vallejo V.R. 2005. Soil-plant relationships and tree distribution in old growth *Nothofagus betuloides* and *Nothofagus pumilio* forests of Tierra del Fuego. *Geoderma* 124: 169-180
- Garcia-Pausas, J.; Casals, P.; Romanyà, J. 2004. Litter decomposition and faunal activity in Mediterranean forest soils: effects of N content and the moss layer. *Soil Biology and Biochemistry* 36: 989- 97
- Romanyà, J., Vallejo V.R. 2004. Productivity of *Pinus radiata* plantations in Spain in response to climate and soil. *Forest Ecology and Management* 195: 177-189
- Reichstein, M.; Rey, A.; Freibauer, A.; Tenhunen, J.; Valentín, R.; Banza, J.; Casals, P.; Cheng, Y.; Grünzweig, J.M.; Irvine, J.; Joffre, R.; Law, B.E.; Loustau, D.; Miglietta, F.; Oechel, W.; Ourcival, J.M.; Pereira, J.S.; Peressotti, A.; Ponti, F.; Qi, Y.; Rambla, S.; Rayment, M.; Romanyà, J.; Rossi, F.; Tedeschi, V.; Tirone, G.; Xu, M.; Yakir, D. 2003. Modeling temporal and large-scale spatial variability of soil respiration from soil water availability, temperature and vegetation productivity indices. *Global Biogeochemical Cycles* 17 (4): 1-15
- Romanyà J., Casals P. & Vallejo V.R. 2001. Short-term effects of fire severity on soil nitrogen availability in Mediterranean fields. *Forest Ecology and Management* 147: 39- 53
- Coûteaux, M.M., Bottner, P., Anderson, J.M., Berg, G., Bolger, T., Casals, P., Romanyà, J., Thiéry, J.M. & Vallejo, V.R., 2001. Decomposition of <sup>13</sup>C-labelled standard plant material in a latitudinal transect of European coniferous forests: Differential impact of climate on the decomposition of soil organic matter compartments. *Biogeochemistry* 54: 147-170.

- Romanyà J., Cortina J., Falloon P., Coleman K. & Smith P. 2000. Modelling soil organic matter after planting fast growing *Pinus radiata* on Mediterranean agricultural soils. *European Journal of Soil Science* 51: 627- 641
- Bottner P., Coûteaux M.M., Anderson J.M., Berg B., Billes G., Bolger T., Casabianca H., Romanyà J., Rovira P. 2000. Decomposition of <sup>13</sup>C labelled plant material in an European 65-40° latitudinal transect of coniferous forest soils: simulation of climate change by translocation of soils. *Soil Biology and Biochemistry* 32: 527- 543
- Casals, P., Romanyà, J., Cortina, J., Bottner, P., Couteaux, M.M. & Vallejo, V.R., 2000. CO<sub>2</sub> efflux from a Mediterranean semi-arid forest soil. I. Seasonality and effects of stoniness. *Biogeochemistry* 48, 261-281.
- Romanyà, J., Casals, P., Cortina, J., Bottner, P., Couteaux, M.M. & Vallejo, V.R., 2000. CO<sub>2</sub> efflux from a Mediterranean semi-arid forest soil. II. Effects of soil fauna and surface stoniness. *Biogeochemistry* 48, 283-306.
- Rovira P., Casals P., Romanyà J., Couteaux M.M., Bottner P. & Vallejo V.R. 1998. Recovery of fresh debris of different sizes in density fractions of two contrasting soils. *European Journal of Soil Biology* 34(1): 31-38.
- Fons J., Sauras T., Romanyà J. & Vallejo V.R. 1997. Sampling strategies in forest soils. *Annals of Forest Science* 54(4): 493-499.
- Romanyà J. & Vallejo V.R. 1996. Nutritional status and deficiency diagnostic of *Pinus radiata* plantations in Spain. *Forest. Science* 42(2): 192-197.
- Cortina J. & Romanyà J. & Vallejo V.R. 1995. Nitrogen and phosphorus leaching from the forest floor of a mature *Pinus radiata* stand. *Geoderma* 66: 321-330.
- Casals P, Romanyà J., Cortina J., Fons J., Bode M. & Vallejo V.R. 1994. Nitrogen supply rate in scots pine (*Pinus sylvestris* L.) forests of contrasting slope aspect. *Plant and Soil* 168-169: 67-73.
- Romanyà J., Khanna P.K. & Raison R.J. 1994. Effects of slash burning on soil phosphorus fractions and sorption and desorption of phosphorus. *Forest Ecology and Management* 65: 89-103.