Master of Science Internship – 6 months

Relationships between agronomic practices/systems and biodiversity at the global scale

Biodiversity experiences a massive decline worldwide, whether for vertebrates or for invertebrates (Ceballos et al., 2017; Goulson et al., 2019). Land use change and particularly agricultural expansion is one of the key drivers of this trend (Dirzo et al., 2014). In parallel, agroecological practices or systems are spreading at large spatial scale (Pretty et al., 2018) and they can alleviate locally this alarming trend by hosting a richer in-field biodiversity (Lichtenberg et al., 2017). However, the effect of agroecological systems like organic farming on biodiversity is also known as highly dependent of the landscape context (Smith et al., 2020). To date there are few analyses of the relationship between the implementation of agroecological practices or systems and biodiversity at large spatial scales. Yet, these analyses could help to identify areas where biodiversity could really benefit from ecological intensification of agriculture. However, a main obstacle makes these analyses difficult: compiling data sets on biodiversity and agricultural practices/systems at the global scale to evaluate their spatial and temporal overlaps as well as their spatial resolution. Therefore, the first objective of the internship is to reference the existing databases on biodiversity as well as agronomic practices/systems at the global scale. Some datasets have already been identified like PREDICTS or BIOTIME (Hudson et al., 2017; Dornelas et al., 2018) for biodiversity. For agronomic databases, for example, EarthStat (fertilization) or PEST-CHEMGRIDS (pesticides) have also been identified. Completing this list and performing an analysis of their content will be the first task of the intern. A second objective is to perform an analysis of their level of overlap to define the potential of their joint analysis. Finally, based on a subset of this former work, a correlative analysis between agricultural practices and biodiversity could be engaged with regard of the interest of the student.

The intern will benefit from an inspiring working environment. The agronomy lab is composed by about 40 public sector workers located within the AgroParisTech center. We are looking for a student with 5 years of higher education with a Master's degree in one or some of the following fields: agronomy, ecology, agroecology. Applicants should be interested in large-scale studies of biodiversity-agriculture relationships. A good command of the R software is expected, especially handling of large datasets. A good command of some GIS software (or related packages in R) is appreciated. Good communication skills as well as a strong interest in reading and writing of scientific publications in English are key qualifications. The student is expected to have basic skills in statistical analysis or modelling.

Starting: Between January and March 2024 at the laboratory Agronomie (INRAE-AgroParisTech-University Paris Saclay, 22 place de l'Agronomie, Palaiseau) for six months.

Gratuity: about 600€/month + 50% of the PassNavigo (about 43€/month)

Supervisors: Dr. Lucile Muneret *https://www.researchgate.net/profile/Lucile_Muneret* and Dr. Nicolas Guilpart *https://www.researchgate.net/profile/Nicolas-Guilpart-2*

Please send a CV and a cover letter at lucile.muneret@inrae.fr and nicolas.guilpart@agroparistech.fr before the 31st of October.

Ceballos, G., Ehrlich, P.R. & Dirzo, R. (2017). Biological annihilation via the ongoing sixth mass extinction signaled by vertebrate population losses and declines. *Proceedings of the National Academy of Sciences*, 114, E6089–E6096.

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Dornelas, M., Antão, L.H., Moyes, F., Bates, A.E., Magurran, A.E., Adam, D., *et al.* (2018). BioTIME: A database of biodiversity time series for the Anthropocene. *Global Ecol Biogeogr*, 27, 760–786.

Goulson, D. (2019). The insect apocalypse, and why it matters. *Current Biology*, 29, R967–R971.

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Lichtenberg, E.M., Kennedy, C.M., Kremen, C., Batáry, P., Berendse, F., Bommarco, R., *et al.* (2017). A global synthesis of the effects of diversified farming systems on arthropod diversity within fields and across agricultural landscapes. *Global Change Biology*, 23, 4946–4957.

Pretty, J., Benton, T.G., Bharucha, Z.P., Dicks, L.V., Flora, C.B., Godfray, H.C.J., *et al.* (2018). Global assessment of agricultural system redesign for sustainable intensification. *Nature Sustainability*, 1, 441–446.

Smith, O.M., Cohen, A.L., Reganold, J.P., Jones, M.S., Orpet, R.J., Taylor, J.M., *et al.* (2020). Landscape context affects the sustainability of organic farming systems. *Proceedings of the National Academy of Sciences*, 117, 2870–2878.