

# TEAGASC PHD WALSH FELLOWSHIP OPPORTUNITY

## “Unravelling the effects of organic and inorganic amendments in soil-Cd speciation and its uptake by crops”

Walsh Fellowship Ref Number 2019055

### Background

Soil risk categorisation for Cd uptake by plants is complicated and not simply governed by soil Cd content. In a previous research project, a risk assessment model to determine the probability of Cd-concentration exceeding the Maximum Levels set by the EC in potato was developed. Specific soil amendments for remediation were tested and although up to 40% reduction in tuber-Cd was observed, the results were not consistent over the tested soils. Therefore a fundamental understanding of the chemistry and kinetics/mode of action of amendments and its interaction with soil and soil solution is required to develop sustainable, effective solutions for farmers while adhering to good agricultural practice. Knowledge of the impact of the soil solution composition on Cd-root uptake could further aid to elucidate the amelioration mechanisms.

The effect of inorganic and organic amendments on Cd speciation in the soil and soil solution will be evaluated in controlled experiments in the presence and absence of crops. Changes in a range of physical-chemical parameters, such as, amount/type of organic matter (solid and dissolved), pH and elemental composition will be evaluated in soil, solutions obtained after selective extractions and/or water (Rhizon). Samples will be collected over the growing season and correlated with the tuber-Cd concentration at the end of the season. The experiment will be conducted in a range of soils (high/low pH, medium/high soil risk, as determined by the risk assessment tool developed in Teagasc) and repeated for a further season without additional addition of amendments. The synergistic/antagonistic effects of cations and organic ligands in Cd-uptake by the roots will be studied in hydroponic- or pot experiments with artificial soil.

Results will be interpreted with the help of geochemical modelling using the multi-surface modelling approach implemented in ORCHESTRA.

### Requirements

Candidates should have a Master's degree in soil science/agronomy or a related subject. Experience in soil analysis and modelling would be desirable, but full training will be provided. The successful candidate should be highly self-motivated.

### Award

The fellowship funding is €22,000 per annum and includes University fees and is tenable for 4 years. The PhD will start in October 2019.

### Further Information/Applications

The PhD student will be primarily based in the Department of Crop Science (<https://www.teagasc.ie/crops/crops/research/>) at Teagasc, Oak Park, but will also spend time in the Soil Chemistry and Chemical Soil Quality Chair Group (<https://www.wur.nl/en/Research-Results/Chair-groups/Environmental-Sciences/Soil-Chemistry-and-Chemical-Soil-Quality.htm>) at Wageningen University.

The postgraduate student will be assigned to, and supported by, the Graduate School WIMEK (“Wageningen Institute for Environment and Climate Research” - <https://www.wur.nl/en/Education-Programmes/PhD-Programme/Graduate-Schools/www.wur.nl/wimek.htm>) and will defend his/her thesis at Wageningen University.

Teagasc supervisor: Dr Sheila Alves, Department of Crop Science, Teagasc, Oak Park, Carlow, Ireland.

Academic supervisor: Dr. ir. J.E. (Bert-Jan) Groenenberg, Soil Chemistry and Chemical Soil Quality Group, Wageningen University, Wageningen, The Netherlands.

Promotor: Prof. Dr. Rob Comans Soil Chemistry and Chemical Soil Quality Group, Wageningen University, Wageningen, The Netherlands

### Application Procedure

Submit an electronic copy of Curriculum Vitae as well as a letter of interest to: Dr Sheila Alves, e-mail: [Sheila.Alves@teagasc.ie](mailto:Sheila.Alves@teagasc.ie)

### Closing date

30 September 2019