



## 2019 PhD Proposal – China Scholarships Council and New Zealand – China Water Research Centre Joint PhD Programme Application

Information to be published on NZ – China Water Centre website if proposal is selected	
<b>Project title</b>	Functional and compositional responses of soil microbial communities to the long-term application of biosolids to a coastal pine forest
<b>Supervisors titles and names</b>	Dr Jianming Xue (Scion), Professor Hong J. Di, Dr Maria J Gutierrez-Gines (ESR) and Professor Keith Cameron
<b>Department</b>	Soil and Physical Sciences
<b>School / Centre</b>	Faculty of Agriculture and Life Sciences
<b>University</b>	Lincoln University
<b>Email contact address</b>	<a href="mailto:Hong.Di@lincoln.ac.nz">Hong.Di@lincoln.ac.nz</a> or <a href="mailto:Jianming.xue@scionresearch.com">Jianming.xue@scionresearch.com</a>
<b>Link to Supervisor's research page</b>	<a href="http://www.lincoln.ac.nz/Lincoln-Home/About-Lincoln/Staff-Profiles/?sti=1&amp;StaffID=Di%20Hong">http://www.lincoln.ac.nz/Lincoln-Home/About-Lincoln/Staff-Profiles/?sti=1&amp;StaffID=Di%20Hong</a>  <a href="http://www.cibr.org.nz/the-cibr-team/soil-science/">http://www.cibr.org.nz/the-cibr-team/soil-science/</a>
<b>Project outline</b> Please outline the PhD project in 300 words (approx)	<p>Biosolids, rich in organic carbon (C) and nutrients, are commonly used as soil amendments on cropland, and preferably on forestland in New Zealand. Biosolids from the Nelson regional wastewater treatment plant have been applied to a 1000-ha radiata pine plantation at Rabbit Island since 1996. Applications of biosolids have been proved to be very beneficial to trees growing on this site. However, the underlying mechanisms of how this management practice improved the functions and services of the soil ecosystem remain unknown. Additionally, how will anthropogenic nutrient addition alter ecosystem processes, leading to declining groundwater quality?</p> <p>The aims of this PhD project are: (1) to determine the microbial feedbacks to environment changes that are involved in C and nitrogen (N) cycling in the plant-soil coupling ecosystem subjected to biosolids amendment, (2) to investigate the impacts of biosolids application on the stability of soil organic matter in sandy soil. This project will test the following hypotheses:</p> <p>1. The biosolids application would change the quantity and quality of soil organic matter and other edaphic properties. These changes are expected to significantly affect soil microbial community and functional activities, resulting in different soil C and N transformation processes and availability between biosolids application and control soils.</p>

	<p>2. As the soil microbial feedbacks and soil C and N transformation processes change, biosolids application may sequentially alter the allocation strategies into aboveground and belowground compartments of forest, and amended nutrients would induced a lower suberin to cutin-derived compounds ratio in soil, which implying that the more litter-sourced input and less root-sourced input into soil organic matter.</p> <p>3. Soil microbial feedbacks to the C and N transformation processes would induce differences in extracellular enzymes among plots. Microbial community and extracellular enzyme activities are directly mediated or influenced by the soil labile C pools and the N retention mechanism. Biosolids application should therefore influence the total and specific enzyme activities, and changes in activities may be correlated with increases or decreases in quantity or quality of C and N fractions.</p>
<b>References for further reading</b> (optional)	
<b>Please indicate if research operational funding is available to support the project, and if so, the sources of funding.</b>	The research operational funding from a MBIE-funded project is available to support this PhD project