RISK ASSESSMENT (RA) CONTRIBUTIONS OF MITHE-RN PROJECTS: SOILS AND PLANTS THEME

Project[a]	Direct Use	Support / Inferential Use	Confidence Building	General Comments
S1 Grant et al. *Impact of Long-And Short-Term Fertilization and Management Practices on Trace Element Dynamics in Crops And Soils*	Empirical predictions of crop concentrations of Cd and Zn from soil information Describing the role of agronomic practice in risk and mitigation	The basic concepts of metal cycling in crops and soils are confirmed	*Scientific:* Illustrates potential and limitation of using free-ion and other bioavailability models in real-world settings *Public:* Risk related results from a real field setting using real equipment and agricultural practices to which the public can relate	The strength of this project comes from a good factorial design repeated over a number of sites for a number of years. Theoretical constructs related to soils and crops, such as the free-ion metal uptake model, are only rarely substantiated by field data. The real environment is just too variable. This experiment illustrates this, and provides the best available models to cope with field variability. RA arguments can be based on these results. Further, and very importantly, this project provides direct, useful risk management information for farmers.
S2 Hendershot et al. *Bioaccessibility of Trace Elements in Agricultural Soils of Eastern Canada*	Sorption information for several metals in soils Soil-to-plant transfer data for urban gardens	Survey of urban gardens will imply the level of concern to attribute to this pathway	*Scientific:* May provide evidence of a path forward in dealing with bioavailability in the soil/plant system terrestrial biotic ligand model (the TBLM)	This project has multiple aspects that are relatively independent, so there is no simple theme to relate to RA. The new method to spike soils with metals, involving leaching, may be an improved experimental method, but there are good methods already. Plant uptake of cerium (Ce) from solution culture is novel, but rather academic to RA, and there is a lot of information of soil-to-plant transfer of Ce. Justification of research on Ce is required. The development of the TBLM is exploratory, but if successful, will have long-term benefits for RA. The survey

				of urban garden soils and plants may provide a good database for RA in urban settings. It would be interesting and useful to partition dust-load and root-uptake metals in sampled produce.
S3 **Berkelaar et al.** *The role of speciation in the uptake of Tl, As, and Se*	Soil-to-plant transfer data for Tl in soybeans	Information on factors affecting plant uptake of Tl (quite novel), Cd and Se	*Scientific:* May provide evidence of a path forward in dealing with bioavailability in the soil/plant system (the TBLM)	This project is a strong contribution to the development of the TBLM. Many of the experiments have been in solution culture, and although informative (especially for Tl as an under-reported element), these data will not inform RA directly. The initial work with Tl in soils will provide directly useful information.
S4 **Courchesne et al.** *The impact of microbial activity and trace metal speciation in the rhizosphere on metal uptake by plants*		Information on the effects of rhizosphere processes inform RA where extrapolation is needed. Garden survey gives information on the relevance of rhizosphere-specific processes	*Scientific:* Undoubtedly rhizosphere processes are critical, and it is important for RA to have advancements in this area	This project tackles the issue of rhizosphere processes with a number of approaches, all of which have good potential to yield useful information. The rhizosphere is expected to be (micro)biologically different from the bulk soil, and by inference there should be effects on metal speciation and bioavailability. Although there may not be information for direct use in RA, there is a good chance that these results may help explain variation in the field that was previously not understood. More importantly, they may be critical in terms of remediation – development and regulatory acceptance of soil amendments to reduce bioavailability (risk management)

S5 **Macfie et al.** *Localization and speciation of metals at the cellular level*		Once micro-site speciation of a few metals is known, inference to other metals may be possible	*Scientific:* Undoubtedly rhizosphere processes are critical, and it is important for RA to have advancements in this area	Knowledge of the speciation of metals in soils is probably the greatest advancement that can be made in RA related to soils and plants. Although theoretical estimates are possible, this project will attempt to provide validation. More importantly, this information may be critical in terms of remediation strategies and regulatory acceptance of soil amendments to reduce bioavailability (risk management)
S6 **Sauvé et al.** *Chemical forms and release of trace elements in soils and soil solutions*	Soil/liquid partition coefficients for selected anions	Relative results from the diffusive gradient thin-films (DGT) method may allow extrapolation among soils and elements	*Scientific:* Validation of a soil ligand model (SLM) will markedly improve decisions about methods to use in RA	This project has two central themes, one to develop and validate models of metal mobility in soils, and the other to expand on the soil sorption information available for contaminant element anions. The work combines practical and theoretical, and so will be very useful to improve RA. This work could lead to an abiotic measure of bioaccessibility of metals in soils that could be used in the RA tool box – for at least screening metals in soils.

a. Project descriptions are available on the MITHE website under ‘Research Activities’