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Arsenic in agricultural soils-water systems: transfer mechanisms, remediation options and recommendations for risk management

FABIENNE BATTAGLIA-BRUNET[1], INGO MÜLLER[2], CELIA JONES[3], MARK ELERT[3], MARINA LE GUÉDARD[4], JENNIFER HELLAL[1], HUGUES THOUIN[1], ISABEL JORDAN[5], RITTA L. KEISKI[6], JANA PINKA[5], AULI TURKKI[6], ESA TURPEINEN[6], HANNA VALKAMA[6], TARJA HATAKKA[7], TIMO TARVAINEN[7], JUHA KAIJA[7] AND KIRSTI LOUKOLA-RUSKEENIEMI[8]

[1]BRGM
[2]Saxon State Office for Environment
[3]Kemakta Konsult AB
[4]LEB Aquitaine Transfert-ADERA
[5]G.E.O.S. Ingenieur-gesellschaft mbH
[6]University of Oulu
[7]Geological Survey of Finland
[8]Geological Survey of Finland,

Presenting Author: f.battaglia@brgm.fr

Chronic exposure to arsenic (As) through food crops is a major health issue. Our AgriAs project [1] evaluated soil-water-crop transfer mechanisms and proposed remediation options. Two sites, one polluted by a former factory of WWI ammunition destruction (Verdun, France), and another contaminated by historical mining activities (Freiberg, Germany) were chosen for the elaboration and evaluation of methodologies [2]. These sites represent different agronomical conditions and the source and distribution of As contamination (hot spots versus large-scale). Spring barley was chosen to study the influence of fertilizers and As-adsorbent on As transfer from soil to plants or water. Bio-indicators including the Omega-3 Index ecotoxicological test and microbial parameters were implemented to monitor As-related processes [3]. Experiments highlighted the potential of a biologically synthesized adsorbent (sorpP) to decrease the mobility of As and the soil toxicity for plants. Effects of fertilizers on the biogeochemical behavior of As differed between soils and redox conditions. Concerning water treatments, reverse osmosis membrane systems, adsorption and coagulation–filtration processes were compared in terms of feasibility and sustainability. Research outcomes contributed to design the conceptual sketch of a health risk assessment model [4]. AgriAs project thus contributed to define recommendations including either the adaption of agricultural and soil management to prevent exposure or remediation measures tailored for different sites and land use.

[1] *AgriAs project website:* http://projects.gtk.fi/AgriAs/; *AgriAs was co-funded during 2017-2019 by the EU and the Academy of Finland, L'Agence nationale de la recherche, Bundesministerium für Ernährung und Landwirtschaft and Forskningsrådet FORMAS under the ERA-NET Cofund WaterWorks2015 Call. ERA-NET is an integral part of the 2016 Joint Activities developed by the Water Challenges for a Changing World Joint Programme Initiative (Water JPI).*

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[3] Battaglia-Brunet et al. (2021), J Haz Mat 409, 124580.

[4] Loukola-Ruskeeniemi K. et al. (2022), J Haz Mat 424, 127677.