

# Evaluation and management of Arsenic contamination in agricultural soil and water - AgriAs

## Bio-hydrogeochemical model of arsenic speciation and transfer in soils

Title of the project:	Evaluation and management of Arsenic contamination in agricultural soil and water - AgriAs
Funding Scheme:	Water JPI Joint Call, ERA-NET Cofund WaterWorks2015
Start date:	01.04.2017
Duration:	24 months
Document title:	Effects of agricultural amendments on speciation and bioavailability of As
Workpackage:	WP2, Task 2.1
Lead partner:	BRGM, France
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Date of delivery:	2018
Dissemination level:	Confidential, Public Summary
Status of the document:	Final
Document location:	Intranet folder: AgriAs/Deliverables/WPX
Project web site:	<a href="http://projects.gtk.fi/AgriAs/index.html">http://projects.gtk.fi/AgriAs/index.html</a>

## Public Summary

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One of the main objectives of the AgriAs project is to develop recommendations and guidelines for sustainable management of As risk associated to agriculture. The effects of agricultural amendments on speciation and bioavailability of As must be determined in order to develop knowledge about the risks associated to the presence of arsenic in cultivated soils. The two study sites are a former chemical ammunition destruction facility from the interwar period converted into agricultural land near Verdun, France, and one site impacted by historical mining activities, near Freiberg in Saxony, Germany.

In order to evaluate the influence of agricultural amendments on the speciation and bioavailability of arsenic in the soils from the two sites studied during this project, microcosm experiments were designed to simulate conditions close to the real site environment. The types of amendments and their doses were chosen in accordance with real agricultural practices on each site. For the Verdun site, three amendments were applied: a PK fertilizer, ammonium sulfate and organic matter. For the Freiberg site, the chosen amendments were lime ammonium nitrate and organic matter.

Results indicate that the addition of amendments did not significantly influence the speciation and the quantity of mobile arsenic. The observed tendencies were, for the Verdun site, an increase of As mobility with PK fertilizer, a decrease of mobility with ammonium sulfate amendment, and no effect of organic amendment. The increase of As mobility by PK amendment was confirmed by a small increase of As content in plants. Moreover, the plant ecotoxicological test, carried out to evaluate the influence of amendments on As toxicity, reveals that the polluted soil amended with ammonium sulfate seems to be significantly less phytotoxic than the un-amended soil. For the Freiberg site, the two amendments, lime ammonium nitrate and organic matter, tended to slightly decrease As mobility.

Microbial parameters linked to arsenic transformation were tested as potential bio-indicators of arsenic bio-availability: most probable numbers (MPN) of AsIII-oxidizing and AsV-reducing microorganisms, AsIII-oxidizing and AsV-reducing activity tests. At the Verdun site, all microbial parameters are linked to arsenic levels in water and soils. They will be used as indicators of arsenic bio-availability in the next experimental phases of the project.