# Eco-geochemical Assessment of Agroecosystems — Cadmium in Chengdu Economical Region, Sichuan, China

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The cadmium (Cd) in Chengdu economic region was studied as an example of eco-geochemical assessment on agroecosystems. Dry and wet atmospheric deposition, chemical fertilizers, irrigation water, and plants were collected. The concentration of Cd and other elements in these samples were analyzed and the fluxes of input and output of the agroecosystem were calculated.

The results indicated that the Cd was more concentrated in the surface soil than in the deep soil, and Cd concentration in some rice samples exceeded the upper limit of the pollution free agricultural products. The input of Cd into the agroecosystem was 17.8 g/hm$^2$·a on average, which accounted for 85.2% of the total input. Infiltration (2.34 g/hm$^2$·a) and harvest (1.87 g/hm$^2$·a) were the two most important Cd outputs. The average increase of Cd content in soil was a result of sources outside the agroecosystem was 0.006 mg/kg·a. In next 20 years, the area of the grade III soil will increase 2-3 times under the current input and output condition of Cd, which lead to significant decrease of the arable land. The decrease of the pH in study area was 0.106/a because of fertilization and acid rain, of which 89.6% was from the contribution of chemical fertilizers. The present study indicates that, even though 95% of rice production is safe, after 20 years, 70% of the safe soil will degrade, and the area of alarming soil will increase rapidly from 4% to 27% of the total cultivated area in the region.

# Speciation of $^{129}$I in the environment and its application

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Despite the huge amount of $^{129}$I (15.7 Myr) releases from human nuclear activities, data on speciation of the isotope in the environment are still scarce. About 90% of the present day isotope inventory in the Earth's surface environments relate to liquid and gaseous discharges from the nuclear reprocessing facilities at Sellafield (UK) and La Hague (France). Emissions from these sources provide a unique opportunity for investigation temporal and spatial exchange and movement of water in the North Sea and the Baltic Sea and subsequently understanding part of the pollution transport within the region. Speciation analysis methods of $^{129}$I and $^{127}$I in environmental samples, such as seawater, and precipaition have been established by our group. The speciation of $^{129}$I and $^{127}$I (iodide and iodate) were analysed in seawater samples collected in Kattegat and Baltic Sea at different water depth as well as in monthly precipitation collected in Denmark. A relatively high concentration of $^{129}$I (3-20×10$^{10}$ atom/L) is observed in the Kattegat, compared with that in the Baltic Sea (<2×10$^{10}$ atom/L). There is a positive correlation between the total $^{129}$I concentration and salinity in seawater. In Kattegat, the ratio of $^{129}I_{iodide}/^{129}I_{iodate}$ is 1-2, while in the Baltic Sea, most of $^{129}$I exists as iodide with a ratio of 2-100. In the precipaition, iodide is the major species of $^{129}$I, accounting for 50-99% of total $^{129}$I, while iodate represents the major species of $^{127}$I, accounting for 43-93% of total $^{127}$I. The results indicate that although total $^{129}$I may give gross information about the sources, transport pathways and sinks, speciation analysis is indispensible for accurate utilization of the isotope as an environmental tracer. Speciation may also be a vital tool for using the ratio $(^{129}I_{iodide}/^{129}I_{iodate})_{source}$ to $(^{129}I_{iodide}/^{129}I_{iodate})_{sink}$ as an age indicator of the transport from the sources to the sinks.