

Establishment of accurate estimation method of heavy metal loads in an agricultural river and origins of heavy metals in Fuku River, Saitama, Japan

*Manatsu Kimura¹, Masaya Yasuhara², Seongwon Lee²

1. Graduate Course in Environment Systems of Geo-Environmental Science RISSHO University, 2. Environment Systems of Geo-Environmental Science RISSHO University

Heavy metals of both dissolved and particulate forms in agricultural rivers are receiving particular attention especially for those potential effects on water environment and aquatic biota of the lower reaches. In this context, it is essential to know not only the heavy metal concentration in river water but also the load which is a product of the concentration of a given heavy metal and river flow rate. In the study for the river cross section 7.7 m wide and ca. 0.3 m~1.0 m deep in Fuku River, Saitama, Japan, the accurate estimation method of heavy metal loads in an agricultural river was established on the basis of high-density flow velocity and concentration measurements across the river cross section.

On the other hand, water level, chemistry and isotope data allowed us to separate the river flow rate of 183,000 m³/day in late June, 2019 into 1) 160, 000 m³/day (86 %) from creek water inflow including paddy drain, and 2) 23, 000m³/day (14 %) from groundwater (base flow). The above-mentioned newly established method in this study was used to estimate heavy metal loads across the river cross section. As the result, creek water inflow including paddy drain proved to contribute 160 kg of Al, 160 kg of Fe, 6.7 kg of Mn, 0.52 kg of Ni, 0.29 kg of Cu, 2.1 kg of Zn, and 0.22 kg of Pb per day to Fuku river. These amounts are 2.2 to about 70 times those from groundwater. This research carried out in summer (June-August, 2019) indicates creek water inflow including paddy drain plays an overwhelming role as an origin of heavy metal loads in Fuku river.

Keywords: River water, River cross section, Heavy metals, Cross-sectional distribution, Dissolved load