

## Observation of flux and outflow-property of radioactive cesium in paddy field; A case study in Kawamata city, Fukushima.

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Dynamics of radioactive cesium derived from Fukushima Dai-ichi NPP accident on land have big impacts on land utilization and migration to water system. There are many paddy fields in Fukushima prefecture. However, the distribution, effect of decontamination and dynamics of radioactive cesium in paddy field have been poorly understood. The outflow of soil attached by radioactive cesium from paddy field can be affected by many factors such as water management, irrigation/non-irrigation periods and inventory of radioactive cesium. For the dynamics of radioactive cesium, input of radioactive cesium through water intake is also one of important processes. To better understand the dynamics of radioactive cesium in paddy field, examination plots were established at planned evacuation zone in Kawamata city, Fukushima prefecture, and the input and output of radioactive cesium were studied through irrigation/non-irrigation period. In addition, the relation between concentration of radioactive cesium in suspended soil obtained in paddy field and the inventory of radioactive cesium was investigated.

Two plots were established. The one was cultivated normally (normal plot, 510 m<sup>2</sup>), and the other was decontaminated by scraping of surface soil with 5-10 cm thickness before cultivation (decontaminate plot, 731 m<sup>2</sup>). To measure the initial concentration and inventory of radioactive cesium, soil core (14 cm depth) was collected from twelve points from each plot, and the core was sliced into 2 cm thickness. The flow volume and suspended soil concentrations in influent/effluent water were monitored by parshall flume/water-level gauge and turbidity probe, respectively. Suspended soil in the water was trapped by time-integrated suspended soil sampler and collected every one or two weeks. The soil core and suspended soil were dried (105 degrees Celsius, 24 hours) and disaggligated by grinding. The activity of radioactive cesium was measured by germanium semiconductor detector. Particle size distribution was measured by laser diffraction particle size analyzer.

The outflows of soil and radioactive cesium showed statistically significant correlations with rainfall in both irrigation/non-irrigation periods, although clear relation was not observed for all data through the two periods. These results indicate that the amount of radioactive cesium migrated from paddy field can be estimated from rainfall by dividing the period into irrigation/non-irrigation periods. Difference in the slopes of the relations indicated that the outflow of radioactive cesium due to rainfall easily occurred during non-irrigation period. The output of radioactive cesium was higher than their input. Although more investigations were necessary concerning on inventory of radioactive cesium at catchment of irrigation water and water management in paddy field, the effective half-life of radioactive cesium in paddy fields can be shorter than the decay half-life. The concentration of radioactivity of cesium in suspended soil showed significant correlation with inventory, indicating that the concentration of radioactivity of cesium in runoff soil is possible to be estimated from their inventory.

Keywords: Fukushima prefecture, Paddy field, Radioactive cesium, Soil, Flux, Inventory