

## **Heavy metals bioavailability under aerobic and anaerobic condition in soil and Bubut rice plant cultivated at Crocker range, Borneo (Malaysia)**

### **ABSTRACT**

Bioaccumulation of heavy metals in rice that can pose health risk is a grave concern as more than half of world populations are rice consumers. Bioaccumulation of heavy metals in rice grain depends on the heavy metal bioavailability in the medium that provide nutrient sources to plant. Throughout paddy life-cycle from seed germination to development of mature seeds, paddy plants cultivated in flooded field are exposed to alternating anaerobic condition and aerobic condition. The aim of this study is to assess whether these two different paddy field conditions influence heavy metal bioavailability in soil and heavy metal accumulation in Bubut paddy plants cultivated at highland of West Coast Sabah, Malaysia. Heavy metal uptake characteristic of Bubut paddy in different part (root, straw and grain) were also determined for baseline data that can be used for selective breeding or Phyto mining. Bubut paddy plants were uprooted together with soil that were collected randomly at 3 months old age (reducing (anaerobic) condition) and harvest season (oxidizing (aerobic) condition) for heavy metal analysis by inductively coupled plasma optical emission spectrometry (ICP-OES). Higher bioavailability of heavy metal at oxidizing condition in soil and Bubut paddy plant were observed compared to reducing condition. Bubut paddy was found to be a potential candidate for Cr, Ni and Zn phytoextraction. Heavy metal concentration in Bubut rice grain is below the maximum permissible limit of Malaysia Food Regulation 1985 (MFR 1985). A comprehensive water irrigation management plan is required to strategically develop at West Coast Sabah to reduce bioavailability of toxic heavy metals and reduce heavy metals toxicity risk in rice consumption