Rice and vegetables contamination in Bangladesh from irrigation - risks to humans and livestock

Over the last 30 years there has been an increasing trend of groundwater usage for irrigation. About 95% of the groundwater extracted in Bangladesh is used for irrigation, mainly for dry season *boro* rice production. One of the consequences of using this ground water is the increasing arsenic levels (AS) (a heavy metal) added in Bangladesh's arable soil through irrigation (estimated to be 1,000 tonnes/year). Scientists from Australia, U.K and U.S.A researching on Bangladesh AS problems concluded that Bangladeshi people are now at a higher risk from exposure of AS because of agricultural crops irrigated with contaminated groundwater.

Crops receiving AS contaminated irrigation water can uptake this element (AS) during the phytoextraction process and bio-accumulate in different degrees at different parts of plants (eg. roots, stems, and grains). Researchers found high concentrations of AS in vegetables and rice in areas where concentrations of AS in soil and water are also high. Therefore, the food chain could be a significant pathway of AS ingestion by Bangladesh people (**see Figure 1**).

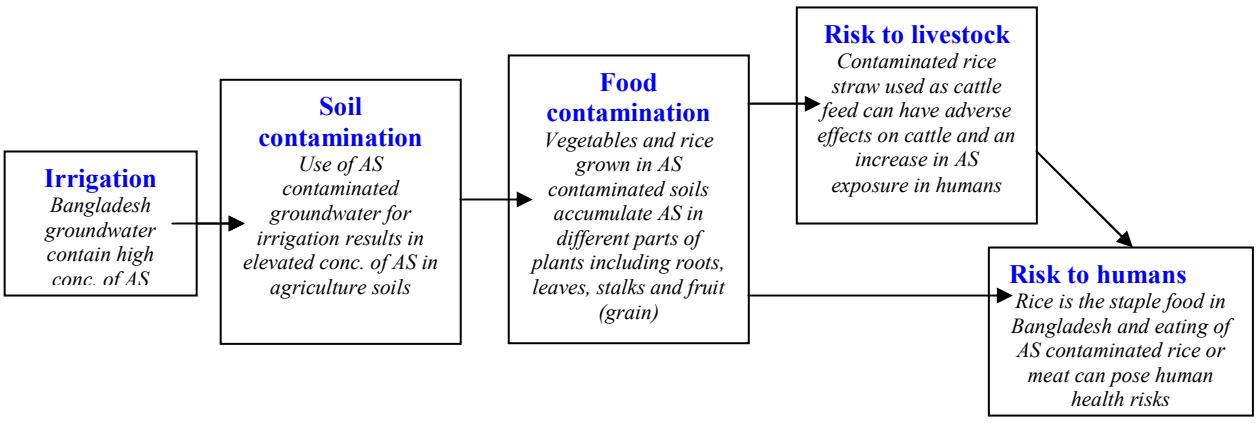

Figure 1 : *A simplified version of rice & vegetables contamination with arsenic in Bangladesh and AS exposure routes to humans and livestock*

Research conducted has found that the greatest concentration of AS is in leafy vegetables (in particular in arum or *kochu*) (**see Figure 2**) followed by other vegetables such as gourd leaf, *lal sak,* data *shak* and *kalmi shak.* Higher concentrations of AS were also reported in rice plants (*boro* rice) in the following orders: rice roots> rice straw>rice grain (**see Figure 3**).

Long time consumption of AS contaminated food may damage kidneys, liver, lungs, bladders and other major organs of humans. Contaminated foods such as rice, vegetables and meat could be an important route of exposure to AS of Bangladeshi people.

Figure 2 : *'Kochu' (Colocassia antiquorum) was found to contain highest AS concentration in every part of this plant (up to 158mg/kg) (recommended guideline threshold levels in food as AS is 1mg/kg)*

Figure 3 : *Dry season rice (Oryza sativa) was found to contain high concentration of AS compared to wet season rice (up to 1.8mg/kg found in Bangladesh rice grain) (recommended guideline threshold levels in food as AS is 1mg/kg)*

A number of measures that may be taken to reduce the risks of AS exposure to humans would be to promote cropping patterns that require less irrigation water, or breeding of rice plants that are tolerant to AS but have a limited AS uptake. Use of hyperaccumulator's plants that take up large quantities of contaminants/pollutants may be a useful, low cost, technology for the removal of toxic AS from Bangladesh soils. In this regard Chinese brake fern, *Pteris vittate* is extremely efficient in extracting arsenic from soils.

References

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