

Characteristics of Water Resources Salinization Issues in Central Asia Aral Sea Basin

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Water resources mismanagement has long been argued as one of the main issues for Central Asian agriculture production. Historically, this region has developed a comprehensive irrigation system at the same time increasing pressure to water and land resources. Converting river flow of the Amu Darya River and the Syr Darya River to create wide distributed irrigation canals (Figure 2) has resulted in significantly reduced flows to the Aral Sea (Micklin et al, 2007), which had reduced surface area of the Aral Sea significantly (Touge, 2016). Dried seabed created desert with sands of concentrated salt remained after water evaporation that is currently spread with winds over the whole region, increasing soil salinization.

Nevertheless, main impact to salinization of soils and lands comes from irrigation technique. Although, facing severe consequences of decisions made in the past, current irrigation practices and water management have not changed significantly. In Central Asia there are mainly three irrigation practices: furrow (more than 60%), strip and basin irrigation. Furrow irrigation is dominant here and most of the channels are unlined. Unlined canals greatly reduce amount of flow water that ultimately reaches agricultural fields, as some of it is lost to the groundwater. Furrow irrigation applied over most of the irrigation areas combined with high temperatures and evaporation rates, creates favorable conditions of soil salinization, waterlogging and water quality deterioration. Accumulated salts and minerals are then washed to the river flow, increasing water salinity in the river,

as most of the drainage channels are also logged and abandoned for long period of time.

The predominant reasons for these developments are poor irrigation water management and inadequate drainage, rising groundwater tables and associated mobilization of primary salts within the soil profile. As a result, huge amount of productive irrigated lands are turning into degraded marginal lands, which are then abandoned by farmers. According to the ADB Final Report, 2008 estimation approximately 600,000 ha of irrigated lands in Central Asia has been stressed over the last decade due to water logging and salinization. Farmers' awareness on soil/water conservation and management of marginal lands is also very low. Measurement of water amount applied to crops and an irrigation scheduling for reclamation of salt prone marginal lands are still based on conventional approaches. Touge, 2016 had showed that application of the adequate water saving techniques, could had had decreased impact to the Aral Sea, while reducing waterlogging and salinization due to application of different irrigation technique. This is further aggravated by the fact that there is absolutely no available data on basic requirements of water management for crops, soil moisture extraction pattern, water requirements of different crops, impacts of water deficits at different crop growth periods and others.

Several development projects have been realized to reconstruct irrigation canals and drainage in the recent decade. While demand for the water resources has been increasing over last decades here,



Figure 1. Aral Sea basin (adapted from Google Maps, Wikimedia)

distribution of the water usage had varied. Agriculture water withdrawal has been slowly decreasing, while municipal water withdrawal has increased (fig. 2) at the same time fertilizer application has been increasing (fig. 3), which will have significant impact for soil salinization. Growing population, anthropogenic and climate change impacts can increased pressure on the water and land resources. In case of Central Asian countries, this has not only food availability issue but also huge economic impact, as it threatens security of water resources availability.

A review of current water resources salinization issues in Central Asia has been analysed. Overall assessment includes analysis of changes happen in last decade, characteristics of different soil and water salinization issues facing Central Asia, collected during field trips and literature review.

Reference

Micklin, P., 2007. The Aral Sea Disaster. *Annual Rev. Earth Planet. Science*, 35, pp.47-72.

TOUGE, Yoshiya. (2018). Development of terrestrial water circulation model in the Aral Sea Basin considering human impacts and climate change. Samarkand, October 2018.

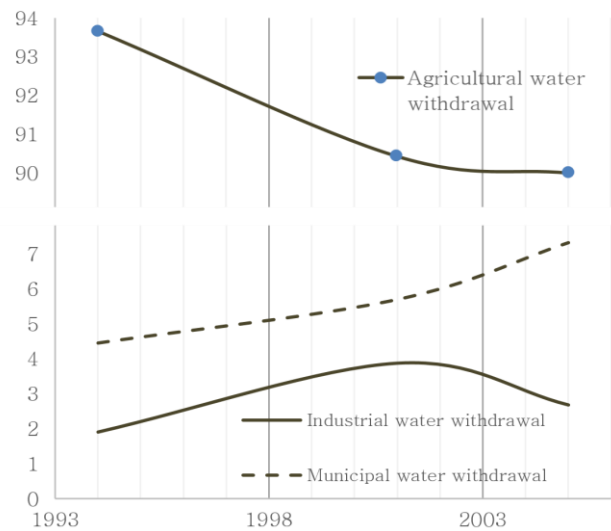


Figure 2. Water consumption in km³ (adapted from FAO Aquastat)

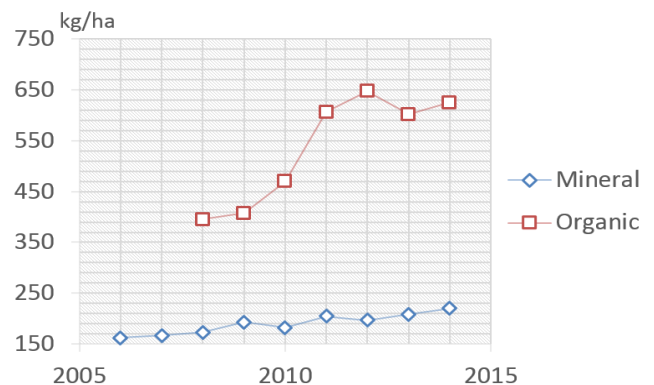


Figure 3. Fertilizer application (adapted from World Bank)