



**Assessment of drainage water quality from the Kirindi Oya and
the Badagiriya irrigation schemes and estimation of nitrogen and
phosphorus loading to the Bundala wetland**

by

Sujeewa Chitrananda Piyankarage

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Abstract

Bundala wetlands of Sri Lanka, an important waterfowl habitat of south Asia, are impacted by agricultural return flows from the upstream irrigation schemes. The Embilikala-Malala lagoon system of the wetland is fed by the drainage water from Badagiriya (850 ha), tract 5 (1020 ha) and tracts 6 and 7 (670 ha) systems, while Bundala lagoon remains largely intact. Quantitative estimates of nitrogen and phosphorus loads, drainage water volume and in-depth analyses of nitrogen and phosphorus species of Bundala, Embilikala and Malala lagoons are required for environmental management along with agricultural practices.

Water flow and water quality were measured since March 1999 for nineteen months. Temperature, pH, conductivity and total dissolved solids were measured in the field. Potassium persulfate digestion technique for total nitrogen, cadmium reduction method for nitrate-nitrogen, Nessler method for ammonia-nitrogen and ascorbic acid method for phosphorus were used. US Army Corps of Engineers FLUX model was used to compute nitrogen and phosphorus loads using flow and concentration data.

Badagiriya and the tracts 5, 6 and 7 areas of the Lunugamwehera Right Bank main canal systems were irrigated with 2.057 MCM and 5.057 MCM of water per month respectively. The salinity hazard of irrigation water of Lunugamwehera Right Bank and Badagiriya systems were low and moderate respectively.

pH of the drainage water was within the preferred range for the aquatic life and the salinity hazard was medium-high to high. The Malala-Embilikala lagoon system was fed with 3.89 MCM of drainage water with 6,400 kg of total nitrogen and 620 kg of total phosphorus monthly. The canals of the tract 5, tracts 6 and 7 and Malala *Oya* contributed about 41 %, 35 % and 24 % respectively for the total drainage volume and the N and P loads discharged to the lagoon system. Nitrogen and phosphorus

loads and the drainage volume of the canal of tracts 6 and 7 and Malala *Oya* were influenced by rainfall events while those of the tract 5 canal were influenced by the irrigation input to its command area. Nitrogen and phosphorus delivery from the tracts 5, 6 and 7 systems was about three times higher than those from the Badagiriya system.

Bundala lagoon was significantly different from the other two lagoons. The Embilikala-Malala is a closed lagoon system in which nutrients are accumulated. Nitrogen and phosphorus from livestock and drainage from the canal of tract 5 affected the northern littoral zone of the Embilikala lagoon.

Bundala, Embilikala and Malala are shallow lagoons which indicated suitable pH levels for most of the aquatic species. According to the total phosphorus levels Bundala lagoon was eutrophic and the other two lagoons were hypertrophic. The water quality of the Embilikala-Malala lagoon system was affected by the agricultural drainage, livestock, breaching of the sand bar except the natural climatic factors. In the case of Bundala lagoon natural factors and livestock were controlling its nitrogen and phosphorus levels.