Hydrology of KOISP and the Bundala National Park

C. R. Panabokke

INTRODUCTION

I propose to deal with some of the more significant *qualitative* aspects of the hydrology of the Kirindi Oya and adjacent river basins together with the various lagoon systems that are located within the Bundala National Park. These qualitative aspects that have not been highlighted in the past studies conducted by IIMI, have an important bearing on how we could better understand the hydrological behavior of the old and new systems and their interactions with the lagoon hydrology.

It is also considered useful to describe and analyze the modifications and interventions that have taken place at different periods over the last 50 years in respect of the macro-features of the hydrology of the Kirindi Oya and adjacent basins.

SITUATION PRIOR TO 1980—KIRINDI OYA

In the old Kirindi Oya irrigation system, water diverted from the main Kirindi Oya at the Ellegala anicut supplied Class I quality water to the Debarawewa, Tissa, and Yodawewa reservoirs in the left bank command area, and to the Pannegamuwa and Weerawila reservoirs in the right bank area. The rice lands under the command of these reservoirs are all located within the natural *flat alluvial plain* of the lower Kirindi Oya. The river course of the lower Kirindi Oya is sufficiently incised to provide good surface drainage to this flat alluvial plain.

Once the water table builds up within this flat alluvial plain during the early phase of the irrigation season, only the ET requirements of the rice crop have to be provided by irrigation issues, because there is very little seepage and percolation losses in this landscape. Hence, the reduced water duty experienced in this old system.

There was also sufficient provision for the riverbed below the Ellegala anicut to get scoured out during peak river flows in the *maha* (wet) season. Thus a natural flushing out of the whole system took place at frequent intervals when high river flows occurred during most maha seasons. The whole system had thereby attained a stable equilibrium over the period 1895–1980.

The Weerawila Ara brought in a very small quantity of sodium salts into the Weerawila reservoir, but it did not cause any salinity buildup because of subsequent dilution with Ellegala-derived Class I quality water. The peak floods experienced in maha 1969 disrupted some of

the functioning drainage-ways under the Yodawewa command area, and complaints of occurrence of salinity in this downreach area close to the sea outfalls had been reported by farmers.

MALALA OYA BASIN—BADAGIRIYA IRRIGATION SYSTEM

The Malala Oya river basin is located within one of the driest environments in Sri Lanka, namely the semiarid tropics. The ratio of discharge to rainfall is the lowest of all river basins of Sri Lanka which is a good index of its dryness. Sodic soils dominate the lower part of its catchment area.

As a consequence, severe salinization was experienced in the command area of the Badagiriya irrigation scheme in the years following 1960, soon after the completion of the headworks and the main delivery system. The water quality of the Malala Oya falls within Class II during the wet season and Class III during the dry season. The concentrated sodium salts in the soil had got leached out after 10 years of irrigation with Class II waters, and by 1970 there were only a few isolated locations of salinity in the drainage bottom lands.

There is no record of any adverse impact that had taken place on the Malala and Embilikala lagoons consequent to the completion of the Badagiriya irrigation scheme. Any adverse impact may have taken place in the initial years after 1960, and may have lasted only a few years.

LUNUGAMWEHERA RESERVOIR AND NEW KOISP

With the completion of the construction of the Lunugamwehera reservoir in 1986 and the provision of irrigation supply to the Right Bank (RB) and Left Bank (LB) Tracts 1 and 2, a drastic and major modification to the hydrology of the old irrigation system took place. The new irrigated lands in Tracts 1 and 2 of the RB traversed a significant extent of sodic soils (solodized solonetz). These soils are located on the residual, undulating mantled plain where the water table hydrology of the landscape is quite different to that of the flat alluvial plain. The seepage and percolation rates of the soil mantle on this residual plain landscape are also very high. Leaching and deposition of sodium salts from these newly irrigated areas to the old irrigated areas took place during the initial years, from 1987 to 1993.

Monitoring of the quality of irrigation water in the Lunugamwehera and the old reservoirs was carried out during the period 1990–1994. Monitoring of the quality of the drainage water at the four *basnawas* (outfalls) commenced in May 1993. The initial buildup and subsequent decline in the quality of reservoir water, irrigation water, and drainage water have been adequately documented (IIMI 1995). It could be observed that most of the salts that had got leached out of the newly developed lands have now got flushed out of the whole system and that a new equilibrium has been attained. The initial salinity hazards have also been greatly reduced and almost eliminated.

IMPACT OF RB TRACTS 5 AND 6 ON THE HYDROLOGY OF THE EMBILIKALA AND MALALA LAGOONS

The landscape of RB Tracts 5 and 6 is made up of a high proportion of sodic soils that occur in a very dry environment, which is also further enriched with atmospheric cyclic salts brought in by the strong southwesterly winds from May to September each year. Even though the water quality in the RB main canal was within Class II, the drainage outflows from Tracts 5 and 6 were enriched with the leached out salts. The drainage water that passed through the Weligatta Ara fell within Classes III and V.

The inflows of this highly enriched drainage water from Tracts 5 and 6 through the Weligatta Ara into the Embilikala and Malala lagoons have disrupted the water quality balance so essential for prawn and fish culture in these lagoons (See IIMI 1995, pp.234–238 for a more detailed analysis and conclusions)

GEOMORPHOLOGY AND HYDROLOGY OF LAGOON SYSTEMS AROUND BUNDALA

The principal coastline and shoreline classes of the south and southeast of Sri Lanka are well-described and discussed by Swan (1983). The stretch of coast between Hambantota and Kirindi Oya outfall is noteworthy for its extensive dunes and large lakes or lagoons, known locally as *lewayas*. These have been formed by the isolation of bays due to drowning and subsequent basin development across the bay mouth. The main shoreline type of this coast is the *bay and headland type with beaches and high dunes.* The beaches are often steep and dunes are high and plentiful.

One very notable feature of the tidal range in this area is the comparatively low difference between the spring tide 75 cm, and neap tide 25 cm. This makes it difficult to manipulate the entry of seawater into the lagoons because of the low head of 50 cm that is available.

The Embilikala *kalapuwa* (lagoon) is an inland lagoon with no direct outfall to the sea, while the Malala lewaya has a direct link with the sea at Malala *modera* (mouth of the river). Inflows into these two lagoons fluctuate according to the amount of drainage water received through the Weligatta Ara and Malala Oya. Water levels in the lagoon vary between +1 m mean sea level (MSL) to about +2.2 m MSL according to inflow.

The Bundala lagoon is located within its own independent catchment and is not influenced by any drainage flow from Weligatta Ara. The western portion of the Bundala lagoon has been converted into a saltern. A greater part of the area covered by this lagoon in its present state could be considered a natural habitat for fish, birds, and other wildlife.

REFERENCES

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