Water Balance of the Estibaná Sub-catchment in Panama

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Abstract: The Estibaná sub-catchment (ESC) has an area of 296 km^2, and is located within the Dry Arc region, in south-central Panama. The main water uses for ESC are human consumption and agriculture. Due to increase in water consumption and climate change, securing water availability has become imperative for this region. Therefore, a water balance has been calculated for this sub-catchment for the 2018-2019 hydrological year. The water balance shows that Precipitation is the only water input, and that Evapotranspiration (ETR) corresponds to 67% of the precipitation. During the dry season (December-April) deficit between supply and demand exists. This situation makes securing water availability in this region, a function of effective water saving policies, based on an integrated water resource management (IWRM).

Keywords: *Water Balance, Panama, Catchment Hydrology, Tropical Hydrology, Evapotranspiration.*

Methods

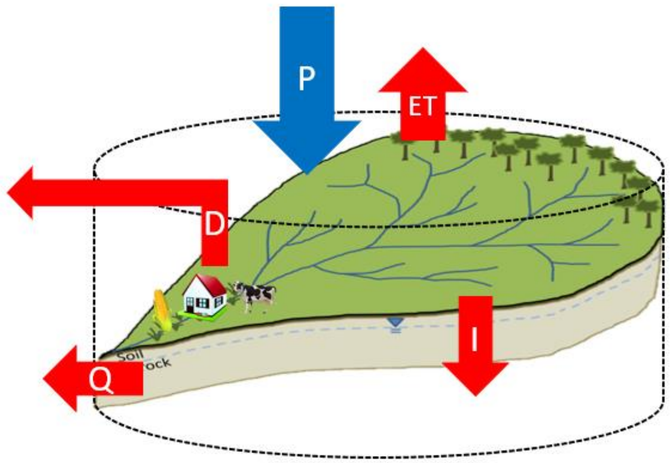

Figure 1. Estibaná Sub-catchment water balance components.

- **Precipitation (P):** Thiessen interpolation from 5 weather stations.
- **ETP:** Penman-Monteith method, one station.
- **ETR:** FAO's crop coefficient method.
- **Runoff (Q):** Calculated using water level data from the Estibaná River
- **Infiltration (I):** Estimated based on soil type and hydraulic conductivity.
- **Water Demand (D)**: Human consumption + agricultural water use + livestock consumption.

Results

- Precipitation is the only input to the water balance and highest amount occurred in June 2018, which does not follow historical pattern.
- ETR is the largest output and corresponds to 67% of the precipitation.
- Total water demand amounts to only 1% of the annual water availability.

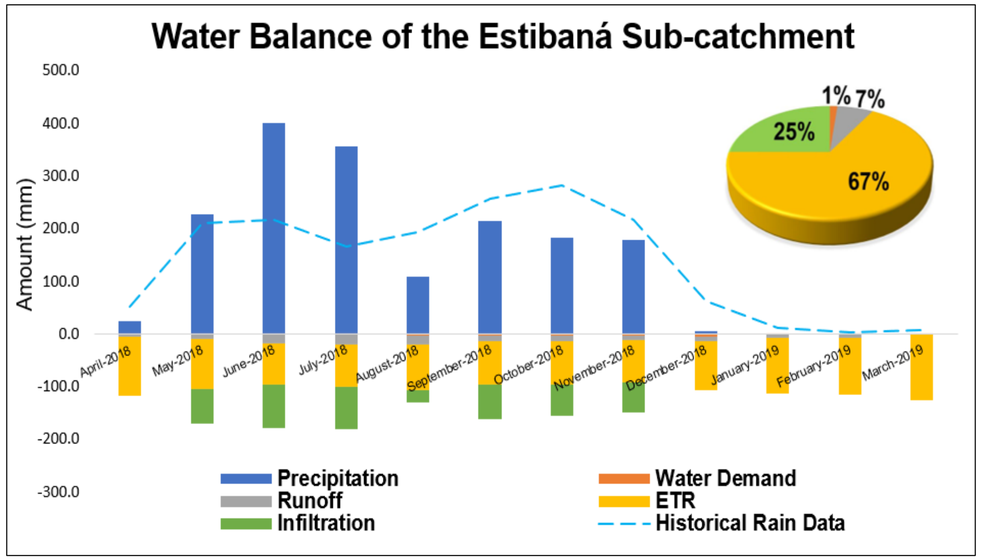

Figure 2. Water Balance of the Estibaná Sub-catchment.

Conclusions

- The water balance indicates that dry season months have a deficit between supply and demand.
- Abnormal variations in precipitation due to climate change will likely worsen this deficit in the future. Efficient water saving policies during the dry season should be the first step to achieve water sustainability.
- These policies should include incentives to the employment of different water sources and capacity building actions, in order to acquire the necessary water related infrastructure to ensure a water secure region.

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