

Increased sedimentation and phosphorus sequestration in a protected estuary due to rapid horticulture expansion

STEPHEN R. CONRAD^{1*}, ISAAC R. SANTOS¹, SHANE A. WHITE¹, CHRISTIAN J. SANDERS¹

¹National Marine Science Centre, Southern Cross Univ., Coffs Harbour, NSW, 2450, Australia (*correspondence: stephen.conrad@scu.edu.au)

Abstract

Agriculture activities in coastal catchments often contribute pollutant runoff such as nitrogen (N), phosphorus (P), and trace metals to estuarine environments. Here, we determine the historical impacts from agricultural expansion using sediment samples from a habitat protected estuary and coastal wetland downstream from intensive historical banana, and now, blueberry plantations (Hearnes Lake estuary, NSW, Australia). The three ²¹⁰Pb dated sediment cores and surface sediment samples analyzed in this study revealed that trace metal and N fluxes recently increased as a result of increasing sedimentation rates. A few localized trace metal enrichments were also observed. Sediment N contents were not enriched, suggesting denitrification of agricultural N during transport. Most importantly, we found a clear link between the sediment P profile and recent blueberry cultivation. P enrichment increased by 9-fold and sediment fluxes by over 40-fold (up to 12.6 mg m⁻² year⁻¹) during the expansion of blueberry cultivation within the catchment since 2002. The trapping of sediments enriched in P by the wetlands provided a good chronology of agricultural practices in the region. With a global and regional increase in estuarine eutrophication, this study further demonstrates the importance of agricultural sources and the role coastal wetlands play in sequestering P from runoff.

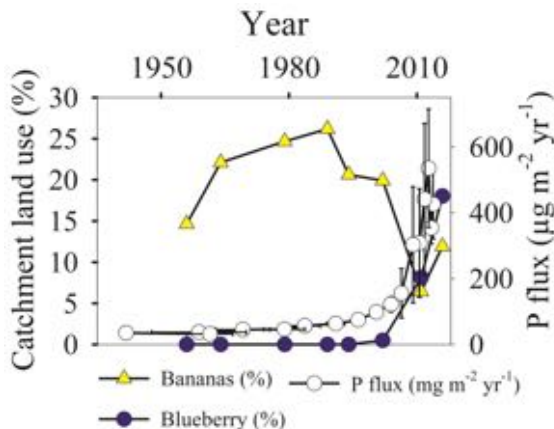


Figure 1: Mean P flux rate (white) from 3 sediment cores compared to catchment banana (yellow) and blueberry (blue) farm area over time. Bars are standard error in year (horizontal) and flux (vertical).