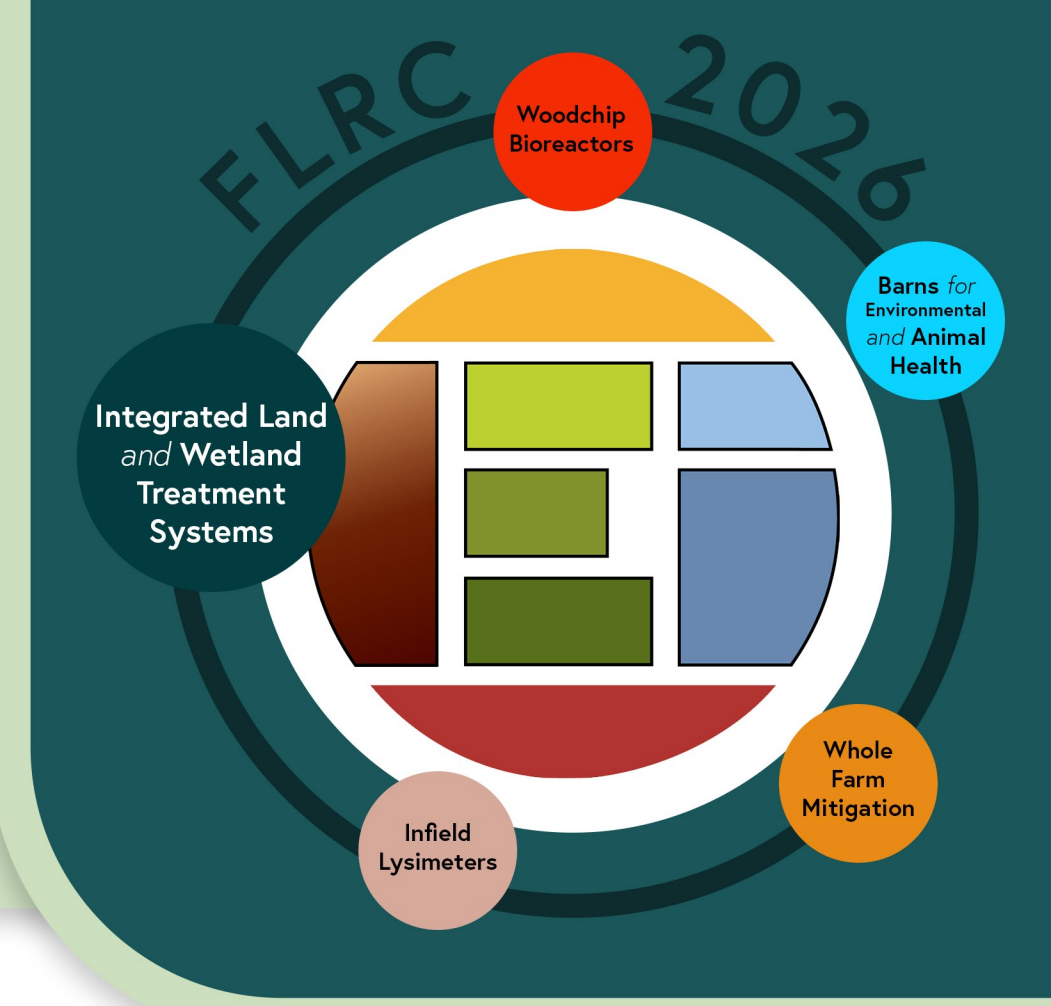


Enhancing Wastewater Management *through* Integrated Land *and* Wetland Treatment Systems



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Outline



Objective

Determination of the efficacy of integrated land and wetland treatment systems in reducing the TN concentration in wastewater entering the environment.

Introduction

Generation of wastewater is an unavoidable consequence of modern society. **Total Nitrogen (TN) concentration in wastewater generated from meat processing plants ranges from 50-841 g/m³** (Bustillo-Lecompte & Mehrvar, 2015), which must be effectively managed to avoid adverse environmental effects. Soil can act as a natural treatment media, containing natural filtering substances (e.g. organic matter, clay particles) that provide physicochemical filtration, and billions of beneficial microorganisms that can attenuate nitrogen in soils. The combination of land application followed by the passage of wastewater through natural (ephemeral) or constructed wetlands could be used to reduce TN concentration in the final wastewater to be discharged safely to the environment.

Methodology

Wastewater from a **meat processing industry** was applied to land using controlled pivot irrigators. Drainage from the land treatment area flowed via a central ephemeral stream into downstream constructed wetlands.

Wastewater samples were collected before land application and from the outlet of the land application area (outlet of the wetland) shown in Figure 1 below.

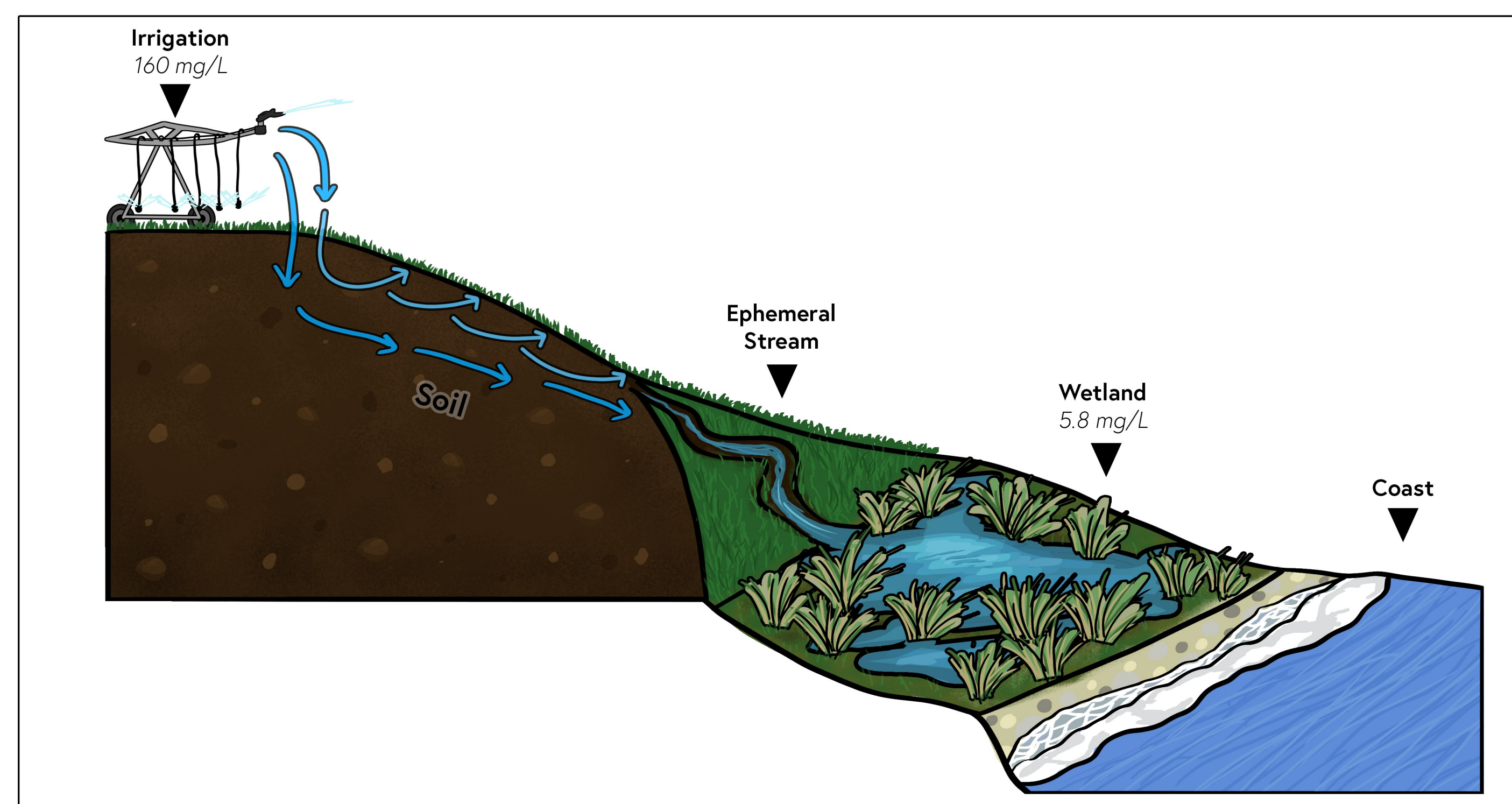


Figure 1: Integrated Land and Wetland Treatment System

Results

The integrated land and wetland treatment system achieved **96% TN removal (Average applied effluent conc. 160 Vs average system outlet conc. 5.8 g/m³)** (Figure 2).

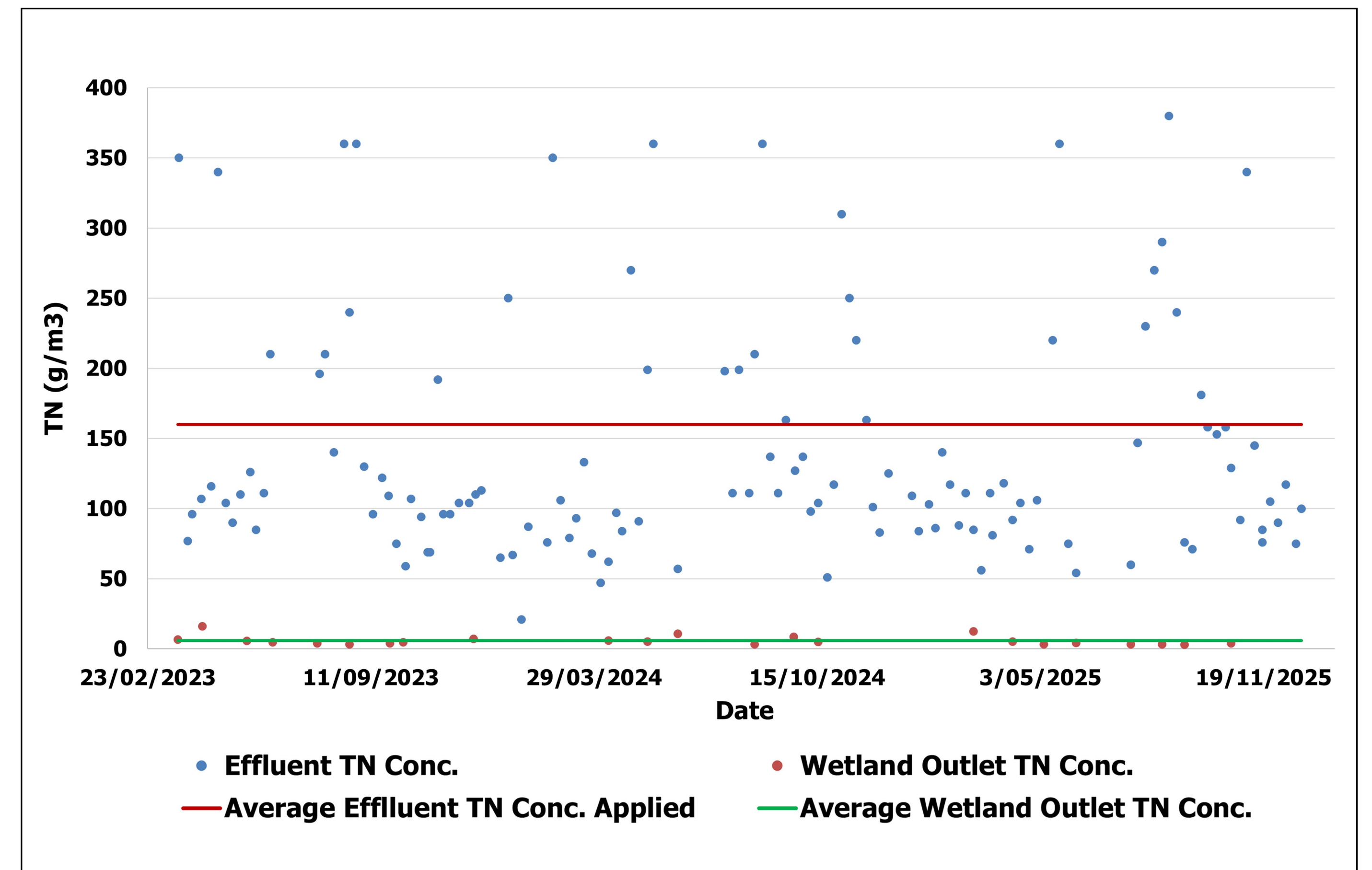


Figure 2: Total Nitrogen Conc. (TN) in Wastewater prior to Land Application and in the Outlet of the Wetland

Plant uptake and crop harvesting export nutrients, while the soil and wetland processes created aerobic and anoxic conditions that supported nitrogen transformation through oxidation and reduction (denitrification) and removal of nitrogen (Beggs et al., 2011).

Conclusion

Integration of land treatment and wetland systems provides a highly effective, sustainable approach to wastewater management, achieving exceptional nutrient removal while safeguarding the surrounding environment.

Recommendation

A comprehensive assessment of soil properties, groundwater conditions, and wastewater characteristics is required prior to the design and installation of an integrated land and wetland treatment system.

References

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- Bustillo-Lecompte, C. F., & Mehrvar, M. (2015). Slaughterhouse wastewater characteristics, treatment, and management in the meat processing industry: A review on trends and advances. *Journal of Environmental Management*, 161, 287–302.