WATER QUALITY INDEXES AND REMOTE SENSING TO SUPPORT FISH FARMING IN A PUBLIC WATER RESERVOIR IN BRAZIL

Janaina Mitsue Kimpara*, Fernando Cortizo da Silva, Luciana Alvim Santos Romani

Embrapa Digital Agriculture
Universidade Estadual de Campinas – Embrapa
Av. Dr. André Tosello, 209 - Cidade Universitária
Campinas, São Paulo, Brazil, 13083-886
janaina.kimpara@embrapa.br

We used water quality indices and remote sensing tools to support fish farming planning and monitoring in the Graminha Reservoir, São Paulo, Brazil. Data collected between January 2020 and May 2024 by the São Paulo State Environmental Agency were used to calculate the Water Quality Index (WQI), which considers the Trophic State Index (TSI) and the Water Quality Index for Aquatic Life Protection (WQIALP). Total phosphorus, chlorophyll-a, dissolved oxygen, pH, toxic substances, and thermotolerant coliforms were considered in these calculations. In addition, Sentinel-2/Copernicus satellite images from 2016 to 2025 were analyzed to assess reservoir hydrological dynamics. Finally, *in situ* measurements from 17 sites across the reservoir included temperature, dissolved oxygen, conductivity, pH, turbidity, alkalinity, orthophosphate ($P\text{-}PO_4$), nitrite ($N\text{-}NO_2$), chlorophyll-a, and total coliforms, following the American Public Health Association methods.

The average WQI was 4.4 upstream and 3.6 downstream the reservoir, indicating regular water quality conditions. The main contributors of this result were total phosphorus and chlorophyll-a, which are directly related to eutrophication. Phosphorus was a critical element. Reservoir volume has shown strong influence on water quality: drought periods and low water levels concentrate pollutants, while sudden refilling events can increase runoff impacts.

Satellite images (Sentinel-2/Copernicus) confirm large fluctuations in water surface area over time. These spatial and temporal variations affect the suitability of specific reservoir areas for cage farming, potentially affecting productivity and profitability.

This study underscores the importance of continuous monitoring and careful management of water resources to safeguard the environment and sustain fish farming activities. The suggested plans include cutting down on pollution, controlling land use around the reservoir, and better planning of fish farming based on water changes. It is also important to adjust fish farming methods to different water quality conditions. Using remote sensing is helpful for planning and checking fish farming activities in reservoirs.

Acknowledgements:
We thank Fapesp for the financial support provided to the Semear Digital Project.