

Prospective study of the aquaculture value chain in the Vale do Ribeira region, São Paulo, Brazil

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Abstract

Aquaculture is expanding in Brazil, being São Paulo a key producer. The Vale do Ribeira region, noted for its abundant water resources and infrastructure, shows strong potential despite productivity challenges. With 458 production units and 300 hectares of water surface, its main species are Nile tilapia and native round fish. The study maps Vale do Ribeira aquaculture value chain profile and highlights low technological adoption as a key barrier for its development. Semear Digital project emerges as a strategic initiative to foster digital inclusion and innovation. The findings inform public policies and investments to enhance sustainability and resilience in the sector.

Keywords: Tilapia farming, sustainable development; water surface, public policies.

1. Introduction

Aquaculture plays an increasingly critical role in global food security, accounting for over 57% of aquatic animal products consumed worldwide and marking its position as the fastest-growing food production sector (FAO, 2024). In this context, São Paulo state stands out as a key contributor, particularly through the “Vale do Ribeira” region and its Agrotechnological District of Jacupiranga. This region offers a unique combination of favorable environmental conditions—abundant freshwater resources, a subtropical climate, and historically developed production infrastructure—which supports its high

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potential for aquaculture expansion. However, its trajectory has been shaped by cycles of advancement and stagnation.

As detailed by Silva (2005), the history of fish farming in the “Vale do Ribeira” reflects broader dynamics of rural development, government policy interventions, and the socio-technical evolution of local innovation systems. These processes have led to both notable successes, such as the creation of cooperatives and research centers, and significant setbacks, including periods of economic downturn and network fragmentation. Today, the region encompasses 458 aquaculture units and around 300 hectares of productive water surface (São Paulo, 2017), indicating substantial installed capacity but also exposing infrastructural and governance challenges.

Positioned at the intersection of historical experience and modern sustainability imperatives, the “Vale do Ribeira” holds untapped opportunities for reinforcing food security, economic inclusion, and environmental stewardship. By mapping production hubs, analyzing governance and innovation dynamics, and identifying infrastructure and market gaps, this research contributes to strategic planning aimed at enhancing the resilience, competitiveness, and sustainability of the aquaculture sector in São Paulo. The findings are expected to inform both public policy design and private sector investment, aligning local development with global sustainability targets.

2. Methods

This study adopts a retrospective approach to investigate the aquaculture value chain in the Agrotechnological District of Jacupiranga and the broader Vale do Ribeira region, São Paulo, Brazil. The analysis is grounded in secondary data sourced from key institutional repositories, including the Brazilian Institute of Geography and Statistics (IBGE) known as the Brazilian Micro and the Agricultural Production Units Census Survey (LUPA). Given data availability constraints, the research focused on quantifying total aquaculture production volumes and assessing the relative contribution of each municipality to the region’s overall aquaculture output.

These datasets were systematically compiled, analyzed, and interpreted to map production hotspots and to provide an initial diagnostic of the aquaculture sector’s structure and dynamics in the region.

3. Results and Discussion

The analysis confirmed that the aquaculture sector in the “Vale do Ribeira” region is predominantly composed of small and medium-sized enterprises, with production heavily concentrated in a few municipalities. According to LUPA data, the region currently accounts for 458 aquaculture units, encompassing approximately 300 hectares of productive water surface. The municipalities of Juquiá, Sete Barras and Eldorado stand out as leading producers, together contributing more than 60% of the region’s total aquaculture farming output (Figure 1).

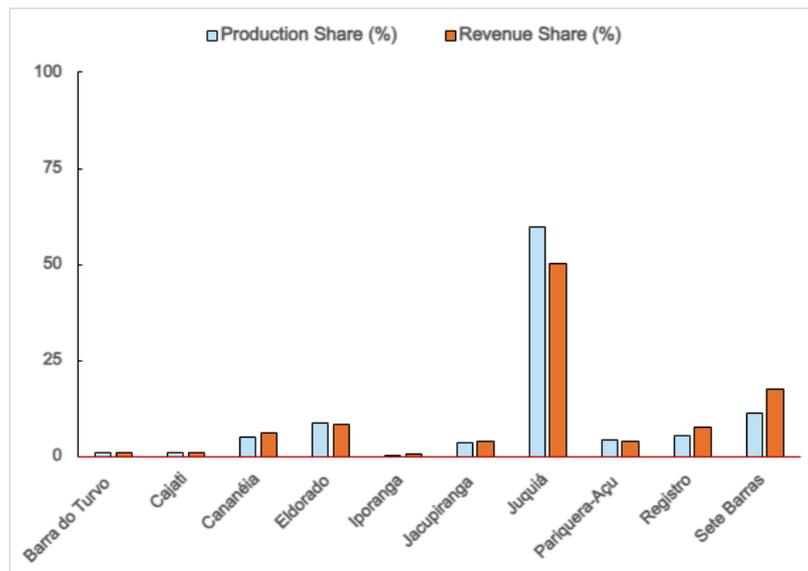


Figure 1. Municipal contribution to fish farming production and revenue in Vale do Ribeira region. **Source:** IBGE (2024).

Tilapia (*Oreochromis niloticus*) remains the dominant species, reflecting national production trends, followed by pacu (*Piaractus brachypomus*), the patinga hybrid (*Piaractus mesopotamicus* × *Piaractus brachypomus*) and a limited proportion of native species (Figure 2). The spatial distribution of production units reveals significant heterogeneity, influenced by environmental factors, historical investments, and proximity to infrastructure and markets.

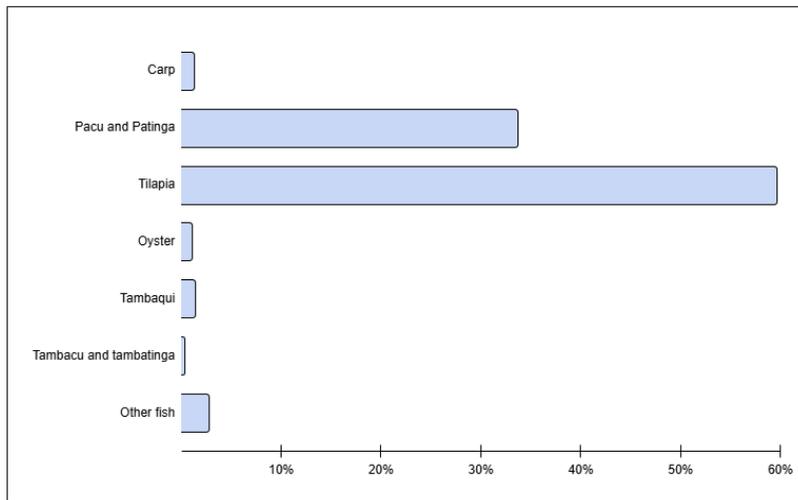


Figure 2. Distribution of farmed fish species in Vale do Ribeira region in 2023. **Source:** IBGE (2024).

Despite its considerable installed capacity, the region’s aquaculture sector faces persistent challenges, including limited technological innovation, fragmented production chains, and fluctuating market access. These findings are consistent with previous studies (Silva, 2005) that highlighted cyclical declines in production linked to governance gaps and inadequate support for modernization. A comparative analysis between 2017 and 2023 reveals that, although total fish production has increased, fewer municipalities reported active aquaculture units in 2023. This spatial contraction may indicate a retreat of smaller-scale producers from the sector, likely due to the structural challenges mentioned above.

Conversely, the current policy landscape, underpinned by sustainability imperatives and FAO’s Blue Transformation framework (FAO, 2024), offers new opportunities to revitalize the sector through integrated development policies and investment in infrastructure and capacity-building. Future research should deepen the analysis of economic performance and socio-environmental impacts to support the design of more effective regional aquaculture strategies.

4. Conclusion

Vale do Ribeira region has a potential for aquaculture farming, particularly Nile tilapia and native round fish, supported by favorable natural conditions and existing infrastructure. However, production remains concentrated in a few municipalities and is

marked by fragmented supply chains and limited technological innovation. The results have practical implications for policymakers and stakeholders, offering insights to guide targeted investments, capacity-building programs, and regulatory reforms aimed at enhancing the sustainability, competitiveness, and social inclusiveness of aquaculture in the region.

Acknowledgements

The authors would like to thank Fapesp (Proc. 2022/09319-9) for the funding. Kátia de Lima Nechet thanks the National Council for Technological and Scientific Development (CNPq) for the research productivity fellowships grants (305187/2022-8).

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