

# **Integrated Land-Use Mapping and Livelihood Resilience: A Geo-Spatial Analysis of Diversification Strategies in Peri-Urban Aquaculture Systems, Gwagwalada, Abuja, Nigeria**

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**Key words:** Access to land; Livelihood Diversification; Integrated Aquaculture; Land-Use Mapping

## **SUMMARY**

**Introduction and Relevance to FIG Theme:** Achieving the Sustainable Development Goals (SDGs)—particularly Zero Hunger (SDG 2) and Sustainable Cities (SDG 11)—requires innovative approaches to land-use planning and resource management in rapidly growing peri-urban environments. This study addresses the critical challenge of enhancing food security and economic resilience through integrated livelihood diversification strategies (LDS) in the context of peri-urban aquaculture in Gwagwalada, Abuja, Nigeria. The research explores how the spatial organization and management of these multi-sectoral farms contribute to local sustainability and climate resilience.

**Methodology and Scope:** The study utilized a mixed-methods approach, combining socio-economic surveys (structured questionnaires and oral interviews) with geo-spatial observation and mapping of a typical fish farm layout in the Compensation Layout of Old Kutunku, Gwagwalada. Primary data was gathered from farm owners, workers, and buyers. The methodology focused on documenting the landscaping (i.e., the spatial planning and infrastructural placement) of the farm, specifically analyzing the functional integration of different enterprises.

**Key Findings on Sustainability and Resilience:** The farm model demonstrates a deliberate move toward a circular economy and climate-resilient land-use system. Key findings reveal that diversification strategies extend beyond aquaculture to include agroforestry and small-ruminant livestock management. Specific integrated practices observed include:

1. **Climate Mitigation:** Planting banana plants along pond banks to provide shade for thermal regulation of pond water, a direct climate adaptation strategy.
2. **Land Stability & Erosion Control:** Utilizing specific grass species and landscaping to check soil

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erosion, thereby strengthening pond integrity and maximizing productive land-use area.

3. Circular Economy: Integrating livestock (goats) to recycle farm inputs and diversify income streams, demonstrating efficient resource use.

The statistical analysis established a significant positive relationship between the adoption of these integrated livelihood diversification strategies and improved household food security, validating the model's economic and social impact.

**Conclusion and Impact:** The Gwagwalada integrated fish farm represents a practical, low-footprint model for resilient agri-food systems in Africa. The success of this model is predicated on effective, though informal, land governance and pragmatic land-use planning. The findings underscore the need for formal land administration and geospatial intelligence tools to map, validate, and scale these integrated, diversified land-use systems to drive equitable growth and meet sustainability targets beyond 2030. The model provides a blueprint for policy intervention to foster resilient livelihoods in vulnerable peri-urban settings.

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