

## **Vertical Farming and Urban Food Resilience: “Empirical Evidence from South West Nigeria”**

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### **Introduction**

The global demand for food is rising due to urbanization, population growth, and evolving consumption patterns, exerting pressure on traditional farming systems (UN DESA, 2022). With diminishing arable land and climate change disrupting agriculture, innovative solutions like vertical farming have emerged as sustainable alternatives (Al-Kodmany, 2019). Vertical farming involves cultivating crops in stacked layers using soilless systems—hydroponics, aeroponics, or aquaponics—within controlled environments to optimize resource efficiency and ensure year-round production (Beacham, Vickers, & Monaghan, 2019). This model reduces land use, water consumption, and dependency on chemical inputs, offering significant potential for sustainable urban food systems (Benke & Tomkins, 2020). However, the impact of vertical farming on sustainable food production remains underexplored, especially in low- and middle-income regions. This study evaluates the impact of vertical farming on sustainable food systems in South West Nigeria. Specifically, it investigates the relationship between adoption rates of vertical farming technologies and sustainable food production, the impact of resource consumption rates, and the effect of the number and size of vertical farming structures. This research adopts a multidimensional approach to assess environmental, economic, and production-based indicators.

### **Methodology.**

This study employed a descriptive survey design to assess the impact of vertical farming on sustainable food production in South West Nigeria. Targeting urban and peri-urban farmers, extension officers, agribusiness actors, and policy stakeholders, a sample of 400 respondents was selected using Cochran's formula and a multi-stage sampling technique across Lagos, Oyo, and Ogun states. Data were collected via structured questionnaires and key informant interviews. A five-point Likert scale was used for perception items. The instrument's validity and reliability were ensured through expert review, pilot testing, and Cronbach's Alpha ( $\geq 0.70$ ). Data were analyzed using SPSS v25.0, applying descriptive statistics and multiple linear regression to examine how adoption rate, resource use, and farm size affect sustainable food production ( $p < 0.05$ ).

### **Results and discussion**

Results from multiple linear regression showed that 68.1% of the variation in sustainable food production is explained by adoption rate, resource consumption, and structure scale ( $R = 0.825$ ,  $p < 0.001$ ). Adoption of vertical farming technologies and larger-scale structures positively and significantly enhanced food production, while high resource consumption had a negative impact. All predictors were statistically significant ( $p < 0.01$ ). These findings confirm the importance of efficient, technology-driven, and scalable vertical farming practices in promoting sustainable urban agriculture.

### **Conclusions**

Vertical farming presents a transformative pathway to sustainable urban food systems in South West Nigeria, contingent on technology adoption, efficient resource use, and infrastructure scaling. To unlock its full potential, coordinated efforts from policymakers, private investors, and extension services are essential. Future research should focus on developing cost-effective, climate-resilient models and assessing long-term environmental impacts. Strengthening regulatory frameworks and fostering innovation through multi-stakeholder partnerships will be critical to sustaining vertical farming's growth and contribution to food security.

**Keywords:** Adoption rate, Number and size of vertical farming structures, Resource consumption rate, Sustainable food production, Vertical farming.