CHAPTER TWO

2.0 REVIEW OF RELEVANT LITERATURE

Review of Literature on the Building Type

Building typology is a foundational concept in architectural theory and practice. It refers to the systematic classification of buildings based on their form, function, spatial configuration, materiality, and cultural or historical relevance. Typologies help architects understand precedents and inform design decisions that balance user needs with aesthetic and environmental performance.

In the context of agro-industrial development, typologies are especially important as they align architectural decisions with economic functions such as processing, storage, logistics, and training. Agro-industrial and vocational buildings are not merely service infrastructures but are strategic tools in national development, especially in agrarian economies like Nigeria's.

These building types support agricultural value chains and skill acquisition, hence their dual role in production and human capital development. Their design must consider not only operational efficiency but also social equity, climate resilience, and community empowerment.

2.1 EVOLUTION OF AGRO-INDUSTRIAL AND VOCATIONAL ARCHITECTURE

Over the past century, agro-industrial architecture has transitioned from basic, informal structures into sophisticated, multi-functional facilities equipped with automation and digital technologies. Traditionally, rural cassava processors used thatched sheds, local wood, and open-air fermentation pits. These lacked hygiene control, mechanization, or protection from weather, which significantly limited productivity and product quality.

With globalization and policy shifts toward industrial agriculture, there has been increasing emphasis on modernized agro-processing facilities. Today, integrated factories incorporate features such as stainless steel food-grade equipment, cold chains, food laboratories, and waste management systems. This evolution responds to both internal policy drivers—like the Agricultural Transformation Agenda—and external market demands such as food safety standards for exports.

Likewise, vocational buildings evolved from informal “learning-by-doing” workshops to structured institutions integrated into technical education systems. In Nigeria, this is reflected in institutions like the National Board for Technical Education (NBTE) and Industrial Training Fund (ITF). The architectural evolution reflects a growing understanding of how built environments influence learning outcomes, productivity, and inclusion.

2.2 CLASSIFICATION OF AGRO-INDUSTRIAL AND VOCATIONAL BUILDING TYPOLOGIES

These building types are typically classified according to function, capacity, specialization, and governance model. Examples include:

Function-Based Typologies:

Processing plants (e.g., cassava, rice, oil palm)

Training centres (agricultural extension, mechanical skills)

Hybrid models combining processing, training, and entrepreneurship incubation

Capacity-Based Typologies:

- Small-scale cottage units (manual, family-owned)
- Medium-scale processing centres (cooperatives, clusters)
- Large-scale industrial factories (private or PPP-led)

Ownership-Based Typologies:

Public: Government-owned vocational institutions

- Private: Commercial agro-processors
- Public-Private Partnership (PPP):Joint initiatives for rural Industrialization

Structural Typologies:

- Modular and prefabricated systems
- Campus-style clusters
- Single-building vertical integration

The type of structure selected impacts design choices related to space planning, sustainability, equipment layout, and expansion flexibility.

2.3 FUNCTIONAL SPACE RELATIONSHIPS IN CASSAVA PROCESSING FACILITIES

Cassava processing requires a logical, linear arrangement of spaces to facilitate a seamless flow of raw materials to finished goods. Misalignment in spatial planning can result in inefficiencies, contamination, and occupational hazards.

- A typical workflow includes:
- Raw Material Reception Bay
- Washing and Peeling Section
- Grating and Dewatering Zones
- Fermentation Chambers
- Drying Platforms (open sun or solar)
- Milling, Sieving and Packaging Units
- Storage and Dispatch Units
- Administrative and Training Areas
- Support Facilities

Clear demarcation between wet and dry zones, good ventilation, and access for vehicles and personnel are critical in efficient design. Workflow design must support both continuous flow production and batch processing options.

2.4 INNOVATIVE AND CONTEXTUAL DESIGN STRATEGIES

Due to resource constraints and environmental conditions in rural Nigeria, particularly Ogun State, context-specific design adaptations are essential:

- Raised concrete platforms to prevent flooding
- Solar drying courts for hygiene and energy efficiency

- Natural cross ventilation to reduce energy needs
- Use of locally sourced materials such as bamboo or stabilized earth
- Sound and vibration insulation near training areas
- Rainwater harvesting and greywater reuse systems

Such design strategies increase the sustainability, affordability, and maintainability of processing buildings in low-resource environments.

2.5 TECHNOLOGICAL AND ENVIRONMENTAL DESIGN TRENDS

- Technological integration into agro-industrial buildings is increasingly necessary for competitiveness and food safety compliance.
- Digital Controls for monitoring fermentation and drying
- Solar Energy and LED lighting for cost-effective power
- Biogas Units using cassava peels and waste
- Composting and organic reuse systems

2.5.1 ENVIRONMENTAL RESPONSES INCLUDE:

- thermal insulation,
- daylighting,
- energy zoning, and
- the use of green buffers for Ogun's tropical conditions.

Case Studies of Similar Facilities

2.6 FACILITY LOCATION KEY FEATURES

FACILITY	LOCATION	KEY FEATURES
• Niji Farms	Oyo State	Modular layout, solar dryers, and biogas systems
• IITA Cassava Centre	Ibadan	Research, training, and high-tech processing
• Kwara Vocational Institute	Kwara	Integrated vocational-agricultural skills hub
• Dangote Agro-Industry	Nationwide	Full production chain with export readiness

These case studies highlight spatial efficiency, climate-responsiveness, and community empowerment.

2.7 CHALLENGES IN IMPLEMENTATION OF AGRO-VOCATIONAL BUILDINGS

- Chronic underfunding of rural industrial projects
- Imported building templates that ignore local context
- Poor infrastructure such as roads and electricity
- Limited representation of women and youth
- Bureaucratic and political delays in public projects

2.8 REVIEW OF LITERATURE ON CASSAVA PROCESSING IN OGUN STATE

Production Status and Constraints

Ogun State is among Nigeria’s top cassava producers, yet the majority of processing remains small-scale and informal. According to the National Bureau of Statistics, over 80% of cassava from the state is processed using traditional, low-efficiency methods.

This leads to:

- Low output quality and market competitiveness
- High post-harvest losses
- Inadequate hygiene and food safety standards
- Wasteful use of energy and biomass

2.9 INFRASTRUCTURE DEVELOPMENT GAPS

Efforts such as the Anchor Borrowers' Programme and Ogun Agro-Hub have made some progress, but structural problems persist:

- Poor feeder roads and lack of rural electrification
- Absence of clustered processing zones

- Scarcity of cold chains and quality control facilities
- Minimal training in advanced machinery operation

2.9.1 DESIGN PRIORITIES FOR OGUN STATE CONTEXT

Considering the region's climate and terrain, responsive design should include:

- Elevated foundations to manage flooding
- Easy access for trucks and farm produce
- Shade structures and green buffers
- Use of local construction materials and skills
- Modular rooms that can adapt to changing needs
- Shared utility cores to optimize cost and maintenance

Gender, Youth, and Inclusion in Design

Involving women and youth—who form the bulk of the processing labor forceis crucial for sustainability and equity. Architectural strategies should include:

- Ergonomically friendly tools and spaces
- Childcare rooms and health bays
- Inclusive training schedules and accessible pathways
- Entrepreneurial workspaces for youth cooperatives

2.9.2 ENVIRONMENTAL MANAGEMENT IN OGUN'S PROCESSING LANDSCAPE

Waste from cassava processing—peels, water, and effluents—can cause environmental degradation. Design approaches to mitigate this include:

- Solar dryers to replace firewood
- Bio-digesters for renewable energy
- Composting systems for agricultural reuse
- Landscaped buffers to absorb runoff and protect water bodies

Future Design Trends

- Recent literature and pilot programs suggest forward-looking strategies:
- Blockchain systems for tracking farm-to-factory processes
- Smart sensors for moisture, pH, and fermentation control
- Modular, mobile units for decentralized rural processing
- AI systems for grading, sorting, and quality assurance
- Circular systems integrating waste reuse into inputs

SUMMARY OF LITERATURE GAPS

Minimal architectural evaluations of existing processing facilities in Ogun

Lack of localized design guidelines for hybrid agro-vocational buildings

Poor documentation of inclusive architectural practices

Weak data on gender and youth in spatial planning for agro-industry

CONCLUSION

The review highlights the urgent need for purpose-built cassava processing factories in Ogun State that combine processing with training, entrepreneurship, and environmental stewardship. A hybrid approach—integrating local building traditions, new technologies, and inclusive planning—is key to addressing economic, educational, and climate-related challenges. Further research involving field surveys, participatory design, and pilot implementation is necessary to develop replicable and scalable models.