



**DESIGN AND DEVELOPMENT OF A WEB-BASED LIVESTOCK
MANAGEMENT AND SALES PLATFORM**

BY

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ENG2008338

DEPARTMENT OF COMPUTER ENGINEERING

FACULTY OF ENGINEERING

UNIVERSITY OF BENIN

BENIN CITY

OCTOBER, 2025



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**A PROJECT SUBMITTED TO THE DEPARTMENT OF COMPUTER
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**IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD
OF A BACHELOR OF ENGINEERING (B.ENG) DEGREE IN COMPUTER
ENGINEERING.**

OCTOBER, 2025

CERTIFICATION

I hereby certify that this project **DESIGN AND DEVELOPMENT OF A WEB-BASED LIVESTOCK MANAGEMENT AND SALES PLATFORM** for the award of B.ENG. was conducted and duly presented by Akhigbe Oiseomaje Famous (ENG2008338) of the Department of Computer Engineering, Faculty of Engineering, University of Benin, Benin City, and is hereby certified.

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Date

DEDICATION

I dedicate this project to God Almighty, whose grace, wisdom, and strength have guided me throughout this academic journey. His divine presence has been my unfailing source of inspiration, perseverance, and success.

I also dedicate this work to the loving memory of my late mother, Mrs. Irene Emwinghare Akhigbe, and my late grandmother, Mrs. Felicia Omoyemwense Egharevba, whose sacrifices, love, and unwavering support laid the foundation for my education. Though they are no longer here to witness this achievement, their prayers, encouragement, and belief in my potential continue to inspire me every day.

I further dedicate this work to my father, Comrade Titus Akhigbe, for his steadfast love, support, and sacrifices, as well as to my beloved siblings, whose constant encouragement and companionship have been a great source of strength to me.

This project stands as a testament to the love, sacrifices, and guidance of all who have shaped my journey. I remain forever grateful.

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I extend my heartfelt appreciation to my late mother, Mrs. Irene Emwinghare Akhigbe, whose love, sacrifices, and unwavering support laid the foundation for my education. Though she is no longer here to witness this accomplishment, her prayers, encouragement, and belief in my potential remain a lasting inspiration.

My profound gratitude also goes to my father, Comrade Titus Akhigbe, for his steadfast support, encouragement, and sacrifices, as well as to my beloved siblings for their constant motivation and understanding throughout this journey.

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ABSTRACT

The increasing demand for efficiency and transparency in Nigeria's livestock sector has highlighted the need for digital solutions that connect farmers, buyers, and agricultural experts in real time. This project, titled "Design and Development of a Web-Based Livestock Management and Sales Platform" focuses on creating a functional and user-friendly online platform that digitises livestock management, marketing, and consultancy services. The system was developed using a combination of HTML, CSS, and JavaScript for the frontend design, while Django (Python) served as the backend framework and PostgreSQL as the database management system. The platform allows farmers (administrators) to list available livestock, manage bookings, update records, and provide consultancy advice, while buyers (users) can browse livestock listings, add animals to cart, view detailed information, and request consultations. Additional modules, such as a blog for farming guides and a testimonial section, were integrated to enhance engagement and credibility.

An Agile development methodology was adopted to ensure iterative design, testing, and improvement throughout the development cycle. The system was deployed on the Render cloud hosting platform, providing online accessibility and scalability for real-world application. Testing results confirmed that the system effectively supports livestock transactions, simplifies communication between stakeholders, and provides a reliable database for record management.

Overall, the project demonstrates how information and communication technology (ICT) can enhance market access, transparency, and knowledge sharing in Nigeria's livestock industry. It contributes to digital agriculture research and provides a scalable model for future integration of payment gateways, analytics, and mobile platforms.

Keywords: Web-based system, Livestock management, Digital agriculture, Django, ICT, E-commerce, Render hosting.

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LIST OF ACRONYMS

ICT – Information and Communication Technology

FAO – Food and Agriculture Organization (of the United Nations)

ITU – International Telecommunication Union

ILRI – International Livestock Research Institute

GDP – Gross Domestic Product

API – Application Programming Interface

UI – User Interface

UX – User Experience

HTML – HyperText Markup Language

CSS – Cascading Style Sheets

SQL – Structured Query Language

URL – Uniform Resource Locator

HTTP – HyperText Transfer Protocol

HTTPS – HyperText Transfer Protocol Secure

APP – Agricultural Promotion Policy (Nigeria)

UN – United Nations

NIRSAL – Nigeria Incentive-Based Risk Sharing System for Agricultural Lending

SSA – Sub-Saharan Africa.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Livestock farming is a vital component of agriculture in Nigeria and sub-Saharan Africa, supporting rural livelihoods and contributing to food security. Nigeria's livestock sector (comprising cattle, sheep, goats, poultry, etc.) alone accounts for roughly one-third of the agricultural contribution to GDP. For example, in 2017 the national herd was estimated at 18.4 million cattle, 43.4 million sheep, 76 million goats and 180 million poultry. Despite these large numbers, production remains largely subsistence-based: most livestock producers are smallholder farmers with limited access to modern technologies and inputs, resulting in low productivity (Ewododhe, 2024).

Nigeria's contribution to global livestock exports is modest, and domestic demand often outstrips supply. This underexploitation is compounded by challenges such as high feed costs, disease outbreaks, conflicts over grazing land, and inadequate veterinary services.

Across sub-Saharan Africa (SSA), livestock and agriculture more broadly are recognised as key to poverty reduction and nutrition. The FAO and ITU note that SSA has the potential to lift “more than 400 million people out of extreme poverty and improve the livelihood of approximately 250 million smallholder farmers and pastoralists” through a significant increase in agricultural productivity. However, achieving this requires “substantive digital transformation of the agriculture sector... through improved infrastructure and increased access to and use of digital technologies”. Globally, digital agriculture is growing rapidly: innovations in information technology, data analytics and mobile platforms are being applied to farming practices to improve efficiency and sustainability. As Nigeria's Minister of Agriculture observed in 2025, the sector is experiencing “significant growth, fueled by the integration of technologies such as artificial intelligence (AI), data analytics, and mobile platforms” (Kyari, 2025).

These innovations can optimize livestock management, from precision feeding to market information. In this context, a web-based platform for livestock management and sales can help digitise animal husbandry records, streamline marketing, and link farmers with buyers and experts.

1.2 PROBLEM STATEMENT

Despite the importance of livestock, the current system of marketing and managing animals in Nigeria remains largely manual and fragmented. Farmers typically rely on informal networks or physical markets to sell livestock, which leads to inefficiencies: information gaps, high transaction costs and price volatility. For instance, smallholder livestock producers often lack timely access to market prices or to buyers beyond their locality, resulting in poor price realization and excess supplies going unsold. An FAO/ILRI report on West Africa highlights that marketing chains, though established, face “economic and institutional barriers... at considerable cost to livestock sector development”. In Nigeria, constraints such as weak market linkages, poor road and cold-chain infrastructure, and multiple middlemen mean that a significant share of livestock value is lost before animals reach consumers (Onifade, 2023).

Furthermore, there is an absence of any integrated digital system for livestock management and sales. Existing agricultural information systems in Nigeria tend to focus on crops or general farm data; very few (if any) platforms allow farmers to list animals, maintain inventories, or process reservations online. Similarly, consultants and extension agents have no centralized channel to reach livestock producers digitally. In short, the gap is the lack of a structured backend management and online marketplace for livestock: farmers cannot easily publish their herd details for buyers to browse, and administrators cannot efficiently monitor sales or records. These deficiencies hinder the efficiency of the livestock value chain and limit the benefits of Nigeria’s national policies for agricultural growth (Onifade, 2023). A dedicated web platform is therefore needed to address these inefficiencies by automating listings, bookings and advisory services.

1.3 AIM AND OBJECTIVES

1.3.1 AIM:

The overall aim of this project is to design and develop a web-based Livestock Management and Sales Platform for a single farm operation. This platform will provide an online marketplace where farmers can manage animal inventories and where buyers can view available livestock and make purchases.

1.3.2 OBJECTIVES

- Objective 1: To develop a user-friendly web interface allowing farmers to list individual livestock (including details such as breed, age, weight, and price).
- Objective 2: To implement a searchable catalogue/database of listed livestock, enabling buyers to filter and browse available animals (by type, location, price, etc.).
- Objective 3: To create a booking and reservation system that allows prospective buyers to request or reserve specific livestock through the platform.
- Objective 4: To integrate a consultancy module where agricultural experts or veterinary consultants can register and provide advice or services to farmers via the platform.
- Objective 5: To develop an administrator dashboard for farm owners or managers to review listings, approve bookings, update animal records, and monitor transaction reports.
- Objective 6: To implement user management features, including secure login for farmers, buyers, and admins, ensuring data privacy and access control.
- Objective 7: To provide a notifications system for users to confirm bookings, or announce new listings.
- Objective 8: To test and evaluate the platform with sample data to ensure it meets usability and performance requirements.

1.4 SCOPE OF THE STUDY

This project focuses on a web application for livestock sales and management under a single-farm context. Key scope boundaries are:

- Included: A browser-based platform accessible via desktop or mobile web browser. It will cover livestock listing (registration of animals), an online catalogue, a booking/reservation workflow, consultant interactions, and an administrative dashboard.
- Excluded: The system will *not* include a mobile app (iOS/Android) . It will not handle crop or fisheries products—only farm animals. Advanced technologies such as blockchain for payments or IoT sensors for real-time animal tracking are beyond this project’s scope. Only a single farm or cooperative is considered (i.e. multi-farm aggregation is not implemented). The system assumes basic internet availability for users and will not cover offline or SMS-only operation.

By clearly defining these boundaries, the project remains focused on core functionalities of livestock listing and sales within a web environment.

1.5 RELEVANCE OF THE STUDY

This platform has practical importance for multiple stakeholders in Nigeria’s livestock sector. Livestock farmers stand to benefit through improved market access and record keeping: by listing animals online, a farmer can reach buyers beyond local markets and reduce dependence on middlemen. This transparency can improve price discovery and income stability. Buyers (e.g. butchers, traders or agribusinesses) will have a convenient way to find and evaluate livestock for sale across the farm’s inventory, saving time and transport costs. Veterinary consultants and extension agents can use the integrated consultancy module to identify and assist farmers in need, enhancing animal health and productivity. In this way, the system helps digital agriculture advocates and students by demonstrating how ICT can solve real agri-industry problems.

From a policy perspective, the project aligns with Nigeria’s and global development priorities. The Nigerian government’s Agricultural Promotion Policy (APP 2016–2020) emphasises modernisation and market-driven agriculture; a digital livestock marketplace directly supports these goals. The system also contributes towards UN Sustainable Development Goal 2 (Zero Hunger) by potentially increasing livestock productivity and food availability through better management. As the Minister of Agriculture noted in 2025, Nigeria aims for “a digitally enabled, inclusive, and sustainable agricultural system that delivers food and nutrition security, drives national

prosperity, empowers youth and women, and builds resilience”. The envisaged platform is a step towards this vision: by linking farmers, consultants and buyers via ICT, it helps drive national prosperity and resilience in farming livelihoods. Additionally, the platform’s development can inform future academic work in digital farming solutions, and it may be of interest to agricultural finance bodies (such as NIRSAL) and international agencies (FAO, World Bank) promoting rural digitalisation (Kyari, 2025; FAO & ITU, 2022).

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION TO THE RESEARCH DOMAIN

The use of digital technologies in agriculture (“digital agriculture”) is rapidly expanding in Nigeria, including livestock production. Recent reports describe Nigeria’s livestock sector as beginning to adopt ICT solutions for animal husbandry and traceability. For example, Salako (2024) notes that cloud-based mobile apps now allow each animal to be tracked by a 2D barcode from birth to slaughter. Similarly, a national planning workshop underscores that Nigeria’s livestock industry – despite being fragmented and data-poor – is moving toward data-driven management of value chains[. In summary, ICT tools (such as mobile apps and online platforms) are emerging as a lifeline for animal health monitoring, product traceability, and market information in Nigerian livestock farming (Moses, 2024; Onifade & Wong, 2024). These developments set the stage for integrating e-agriculture, e-commerce, and digital extension into livestock businesses.

2.1.1 DIGITAL AGRICULTURE AND ICT IN NIGERIAN LIVESTOCK FARMING

Digital agriculture applies ICT to farm management, and in Nigeria this includes smartphone apps, sensors, and information systems for livestock. Recent initiatives illustrate this trend. For instance, a Nigerian feedlot project uses a smartphone app to register and track individual cattle across the supply chain (Moses, 2024). Likewise, the Nigerian Livestock Master Plan (LMP) process emphasizes collecting comprehensive data on livestock (cattle, sheep, goats, poultry, pigs) to inform investment and disease control. These efforts reflect a growing recognition that ICT can improve livestock productivity and safety. However, the literature also reports significant hurdles: fragmented value chains, resource inefficiencies, and insufficient research capacity still hamper the sector. In short, digital tools show promise for Nigerian livestock farming, but systematic data collection and adoption remain work in progress (Moses, 2024; Onifade & Wong, 2024).

2.1.2 E-COMMERCE IN LIVESTOCK SALES

The rise of e-commerce is reshaping how livestock products are sold. In Nigeria, online marketplaces and digital supply-chains are beginning to connect producers directly with consumers and processors. For example, platforms such as Livestock247 enable farmers to list poultry, goats or cattle for sale to abattoirs and traders via an online portal (Oyelami, 2023). These platforms often include features like traceability and quality certification. Empirical reviews suggest that e-commerce in agriculture can greatly expand market access and reduce waste. Oyedotun (2024) argues that Nigerian agri-e-commerce, by eliminating middlemen and improving transparency, can boost farm incomes and product affordability, though he cautions that digital literacy and infrastructure must improve. In the livestock context, this means that online sales (e.g. for chicks, feeds, meat) are becoming feasible, with benefits for sustainability and profitability (Oyedotun, 2024; Morepje et al., 2024). However, Nigerian producers must overcome the digital divide and trust issues to fully leverage online livestock trading (Oyedotun, 2024; Morepje et al., 2024).

2.1.3 ONLINE CONSULTANCY AND EXTENSION SERVICES IN AGRICULTURE

Online advisory and extension services are vital for modernizing livestock farming. Digital extension leverages ICT (mobile phones, apps, web portals) to deliver real-time information on animal health, feeding, breeding, and markets. In Nigeria, studies emphasize that most rural livestock farmers already own basic mobile phones, yet they rarely use them for formal agri-advice. For example, Joel et al. (2025) found that only about 10% of surveyed farmers accessed extension through ICT, even though 75% owned mobile phones. On the other hand, practitioners highlight the impact of digital advisory: Dauda (2025) reports that e-extension can give livestock keepers timely alerts on disease outbreaks, veterinarian guidance, and best practices, significantly increasing yields and incomes. Thus, while digital consultancy has shown great potential to empower Nigerian livestock producers (Dauda, 2025), low adoption and uneven usage (Joel et al., 2025) reveal an implementation gap. Strengthening online extension (through apps, call centers, SMS, etc.) remains a key theme in the literature.

2.1.4 MOBILE TECHNOLOGY AND RURAL INCLUSION

Mobile phones are the linchpin of rural digital inclusion. Nigeria's mobile subscriber base now numbers over 200 million, and smartphone adoption has soared (Kolapo & Didunyemi, 2024). Recent data indicate that Nigeria's internet penetration grew from 38% in 2014 to 58% in 2015, and is projected to reach roughly 60.8 million smartphone users by 2025. In rural Nigeria, basic phones are ubiquitous, but smartphone ownership is much lower among farmers. Kolapo & Didunyemi (2024) note that poor network coverage, unreliable electricity, and the cost of smartphones are the main barriers for rural users. Still, mobile money and USSD-based systems are increasingly available even in remote areas. Given these trends, the literature suggests designing livestock platforms for low-bandwidth environments and feature phones, to maximize rural inclusion (Kolapo & Didunyemi, 2024; Dauda, 2025). In summary, mobile technology is widely viewed as a gateway for rural farmers to access information, markets, and e-services, but significant gaps in coverage and affordability must be addressed (Kolapo & Didunyemi, 2024; Dauda, 2025).

2.1.5 TRUST, SECURITY, AND USER EXPERIENCE IN AGRICULTURAL WEB PLATFORMS

Trust and security are crucial for online adoption in the agricultural sector. Nigerian livestock producers tend to be risk-averse about digital transactions, fearing fraud or product quality issues. Research on African e-commerce finds that farmers' confidence depends on clear transaction processes, payment security, and data protection. Morepje et al. (2024) emphasize that safe, transparent marketplaces — with verifiable ratings and secure payment gateways — are needed to gain farmers' trust. In Nigeria specifically, Akinola & Ashaolu (2023) identify privacy and cybersecurity gaps in e-commerce, underscoring the need for stringent policies and encryption to reassure users. User experience (UX) is another factor: interfaces should accommodate low-literacy users and local languages. Poor UX can deter even interested farmers. Overall, the literature suggests that for a livestock web platform to succeed, it must combine robust security (e.g. SSL, trusted payment systems) with simple, intuitive design (Morepje et al., 2024; Akinola & Ashaolu, 2023). These elements are critical to build confidence among rural users in any online livestock solution.

2.1.6 GENDER ROLES AND ACCESS TO DIGITAL AGRICULTURAL TOOLS

Gender dynamics shape access to livestock technologies. Although men and women often have similar ICT usage rates in West Africa, systemic inequalities limit women's benefits (Zougmore & Partey, 2022). In Nigeria, women typically have lower incomes, less control over household finances, and restricted mobility, which constrain their ability to afford phones or travel to charging stations. For example, an expert review notes that only about 10% of Nigerian women had regular internet access in 2018. Agricultural extension literature indicates that female farmers often operate small ruminant and poultry enterprises; policymakers are beginning to target these as “feminized” livestock chains (Maiha, 2025). To bridge the gender gap, the literature advises digital inclusion initiatives — such as women-only training, micro-loans for smartphones, and platforms tailored to women's needs (Zougmore & Partey, 2022; Dauda, 2025). In summary, while ICT can empower women livestock entrepreneurs, persistent socio-economic barriers mean that gender-sensitive design and outreach are required to ensure equitable access (Zougmore & Partey, 2022; Maiha, 2025).

2.2 UNDERSTANDING THE LIVESTOCK BUSINESS RESEARCH

Livestock farming in Nigeria encompasses a wide range of species and scales. According to Olajide & Akpan (2024), major livestock categories include poultry (chicken, turkey, duck), cattle, goats, sheep, pigs, and Equids (horses, donkeys). As of 2017, Nigeria annually produced on the order of 180 million poultry birds, 76 million goats, 43.4 million sheep, and 18.4 million cattle. Much of this production is by smallholders and pastoralists using free-range or semi-intensive systems. For instance, traditional extensive grazing is common in the North, while intensive poultry farms are rising in the South. The livestock business is thus highly diverse: small farmers supply local markets, itinerant herders provide herds for live trade, and emerging agribusinesses process meat and eggs for urban consumers.

In research terms, “livestock business” covers production, distribution, and consumption links in these value chains. Studies emphasize the roles of animal health, breed improvement, feed provision, and market channels. For example, disease management is a critical challenge: experts report that inadequate veterinary

infrastructure and weak biosecurity severely limit productivity and increase losses. Additionally, the absence of reliable data and fragmented marketing channels have long hampered strategic planning (Onifade & Wong, 2024; Olajide & Akpan, 2024). Contemporary research often focuses on improving these areas through technology – for instance, developing decision-support tools for herd management, digital traceability systems, and online marketing platforms. Understanding the livestock business therefore involves both the agro-ecological context and the socio-economic networks of producers, traders, and consumers in Nigeria’s agricultural sector (Onifade & Wong, 2024; Olajide & Akpan, 2024).

2.3 CHALLENGES ASSOCIATED WITH THE RESEARCH

Research and implementation of digital livestock solutions in Nigeria face several interrelated challenges:

- **Infrastructure and Connectivity:** Many rural areas still lack reliable internet or mobile networks. Joel et al. (2025) report that nearly all surveyed farmers cited inadequate ICT infrastructure and poor connectivity as major barriers to using digital services. Likewise, unreliable electricity for charging devices is a constant constraint for digital interventions.
- **Digital Literacy and Training:** A lack of computer and smartphone skills limits farmers’ ability to adopt new tools. Even where phones are available, only about 10% of livestock producers in one study used ICT for farm information. This suggests a gap in awareness and capacity.
- **Cost and Affordability:** The price of smartphones, data plans, and online services can be prohibitive for subsistence farmers. Joel et al. (2025) note that high costs are cited by over 90% of respondents as impeding ICT usage. This includes costs of devices as well as transaction fees on platforms.
- **Trust, Security, and Privacy:** As discussed, uncertainty about transaction security and product quality creates reluctance. Any research or solution must address cybersecurity and trust-building. Morepje et al. (2024) highlight that ensuring secure, transparent operations is essential to encourage smallholder participation in e-commerce.

- **Market Structure and Logistics:** The livestock sector's fragmented value chain complicates online models. Nigeria's livestock markets are highly decentralized; transporting live animals or meat across regions involves logistical hurdles and spoilage risk. Onifade & Wong (2024) emphasize that poor infrastructure (roads, storage) and inefficient supply chains undermine online marketplace benefits.

In summary, literature on Nigerian livestock ICT consistently cites poor infrastructure, limited farmer capacity, high costs, and security concerns as critical challenges. Any web-based solution must be designed with these constraints in mind, incorporating lightweight technologies, offline capabilities, and strong user support.

2.4 REVIEW OF RELATED WORKS

Several recent initiatives and studies have tackled aspects of digital livestock commerce and management in Nigeria and beyond. In the broader agricultural context, Morepje et al. (2024) review how e-commerce platforms influence smallholder farmers in Sub-Saharan Africa, finding that digital marketplaces can expand access to inputs and buyers while requiring supportive regulation and training (Morepje et al., 2024). In Nigeria specifically, entrepreneurial platforms have emerged: for instance, Livestock247 is a domestic startup offering an online marketplace for poultry and ruminant farmers. Its web portal and app let users buy and sell day-old chicks, goats, feeds, and vaccines, with features like animal tagging and integrated veterinary advice. Similarly, Afrimash provides a broad input-commerce platform (including feed and vet supplies) for farmers nationwide. Farmcrowdy's retail arm (FC Foods) connects rural egg and meat producers with urban consumers through a managed "farm-to-fork" model. All these examples illustrate the diverse approaches companies have taken to digitize Nigeria's agri-supply chain.

Academic literature on e-livestock is sparser, but relevant work exists. Some researchers have proposed web or mobile systems for livestock record-keeping, traceability, and advisory services. For example, studies in other countries (e.g. Austria, India) have demonstrated herd-management dashboards and animal health tracking apps. While there is no well-known published case specifically on a Nigerian livestock portal, analogous work on crop markets and e-agri tools provides guidance. For instance, studies on e-extension (Joel et al., 2025; Dauda, 2025) and e-commerce

(Oyedotun, 2024; Morepje et al., 2024) offer transferable insights for livestock applications. In summary, though direct precedents are limited, a combination of existing agricultural ICT platforms and academic findings form the basis for the proposed project's design.

2.5 RESEARCH GAPS

Despite the growing interest, several gaps remain in the literature on web-based livestock solutions. First, empirical research on actual usage of ICT by Nigerian livestock farmers is scarce. Joel et al. (2025) emphasize that, even as new digital tools appear, adoption rates are still extremely low (only ~10% usage reported), suggesting an evidence gap on how to bridge the “last mile” of technology uptake. Second, the specific needs and experiences of livestock farmers (as opposed to general farmers) are under-examined; most studies lump crops and livestock together. This leaves a gap in understanding how digital platforms should be tailored for herders, ranchers, and pastoral communities. Third, the gender dimension in livestock ICT has been little studied in Nigeria. As Zougmore & Partey (2022) note, the interplay of gender, technology, and agriculture is under-researched, and it is unclear whether current designs serve women effectively. Finally, there is a lack of user-centered design literature on agricultural web platforms: few studies document how farmers interact with interfaces, what UX features they prefer, or how trust signals should be integrated. In sum, the review reveals that while many conceptual and technical pieces are emerging, there is a notable shortage of field-validated research on usable, secure livestock e-commerce systems in the Nigerian context (Joel et al., 2025; Zougmore & Partey, 2022; Onifade & Wong, 2024).

2.6 COMPARATIVE REVIEW OF LIVESTOCK E-COMMERCE PLATFORMS

The table below compares key livestock-focused e-commerce platforms relevant to Nigerian farmers. It includes native livestock sites and broader agri-marketplaces that serve livestock producers. For each, overall user ratings (approximate) are given alongside strengths (Accessibility, UX, etc.) and special features as gleaned from available sources. Note that star ratings are illustrative based on user reviews and expert commentary.

Table 2.1: Comparison of Livestock Business Website Services

Website	Livestock247	Meat247	Farmcrowdy (FC Foods)	Afrimash	NaijaFarmLink
Overall Rating	★★★★☆ (4.5/5)	★★★★☆ (4.3/5)	★★★★☆ (4.2/5)	★★★★ ★★☆ (4.0/5)	★★★★☆ ☆ (3.8/5)
Website Link	livestock247.com	meat247.ng	farmcrowdy.com	afrimash.com	naijafarmlink.ng
Accessibility	Medium (requires smart device)	Medium (web interface)	High (apps + web)	High (mobile/web friendly)	High (simple UI)
Affordability	Moderate (free to join, paid services)	Moderate (premium meat cuts)	Moderate (subscription model)	Low (no signup fees)	Low (no commission fees)
User Experience	Good (clean design)	Average	Good	Good	Good
Customer Support	In-house veterinary team	Moderate (email/phone)	Basic (chat support)	Good (responsive team)	Unknown

Special Features	Animal ID (AIMS) traceability; health records; online vet chat	Pre-order fresh meat cuts; full traceability via QR codes	Farmer–investor match off-taker model; farm-to-fork tracking; guaranteed buyers	B2B input marketplace (feeds, vet drugs); nationwide delivery; loyalty discounts	Multi-state marketplace; quality verification; broad product range including livestock
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Following this comparison, several strengths and weaknesses emerge. Livestock247 excels at integrating animal health with commerce. Its traceability system (animal tagging via the AIMS app) and dedicated veterinary support build trust in the platform. However, requiring smartphone usage limits its accessibility to remote farmers (Joel et al., 2025). Meat247 provides farm-fresh meat ordering with quality guarantees, which is valuable in urban markets, but it operates at a premium price point and relies on pre-orders (48-hour notice for fresh cuts), making it less flexible for casual buyers. Farmcrowdy's FC Foods offers a reliable market linkage via its off-take model; this gives farmers guaranteed sales at known prices, which greatly reduces market risk. The downside is that FC Foods often bundles inputs and requires adherence to cropping plans, which some smallholders may find restrictive. Afrimash has the advantage of massive scale and convenience for input procurement – farmers can easily order feeds and veterinary supplies nationwide. Its platform is accessible and frequently updated, though its focus is more on inputs than livestock products specifically. NaijaFarmLink as a newer entry promises direct farm-to-market connections and claims broad reach, but since it is recent, its customer support and long-term reliability are yet to be fully proven.

In general, platforms that prioritize transparency and ease of use tend to score well. For example, Livestock247's clear QR-code tracing aligns with recommendations in the literature on trust. In contrast, platforms that lack strong rural support or require complicated signup see lower rural adoption (Kolapo & Didunyemi, 2024). All of the above platforms show secure payment options and some form of delivery or pickup coordination, addressing common concerns about cash transactions. No single platform covers all needs: hence, farmers often use multiple services. Overall, the analysis suggests that the ideal livestock e-commerce solution must combine traceable quality assurance (a strength seen in Meat247 and Livestock247) with broad accessibility and affordable pricing (stronger in Farmcrowdy and Afrimash) while also offering responsive support and simple user interfaces.

2.7 REVIEW OF TOOLS AND TECHNOLOGIES TO BE DEPLOYED

The project's web-based platform will leverage standard, open-source web technologies known for scalability and security. On the frontend, will make use of HTML5, CSS3 , and JavaScript, to build a responsive, mobile-friendly interface. For styling and UI components, frameworks like Bootstrap ensure consistency and accessibility across devices. On the backend, Python with Django will be used. The database to be used is PostgreSQL to store user accounts, livestock listings, transactions, and content securely.

To handle user authentication, payments, and data storage, the platform will integrate secure APIs. For example, Nigerian-focused payment gateways such as Paystack or Flutterwave can be used to process payments (to ensure ease and trust for local users). Development tools will include an IDE or code editor, such as Visual Studio Code. For the graphics, Figma will be employed. The site will be deployed on Render, a reliable hosting environment with SSL encryption for security. Overall, the technology stack will follow best practices for web development to ensure the platform is fast, secure, and accessible, drawing on the literatures' emphasis on using proven web technologies for agricultural e-commerce (Morepje et al., 2024; Oyedotun, 2024). Each chosen tool will be critically evaluated for cost, performance, and ease of use by the target users.

CHAPTER THREE

METHODOLOGY

This chapter outlines the methodology and development process of the web-based livestock management and sales platform. It describes the software development lifecycle (SDLC) strategy, including the chosen Agile approach and how the project workflow was organised. The chapter also details how analysis, design, implementation and testing activities were structured to achieve the project objectives using the specified tools and technologies.

Emphasis is placed on an iterative development cycle that allowed continuous improvement of the system through successive sprints. Each completed feature was reviewed and tested before development continued, ensuring that the final product met the requirements effectively and efficiently.

3.1 METHODOLOGY ADOPTED

The Agile software development model was adopted for this project. Agile emphasises iterative and incremental development, allowing flexibility to refine requirements and functionality over time. This approach differs from the traditional waterfall model by supporting regular feedback and incremental improvements.

Development was organised into a series of short, time-boxed sprints (each lasting approximately one to two weeks), each focusing on specific features or modules. At the end of each sprint, the newly developed components were reviewed and tested before proceeding to the next phase. This iterative cycle meant that issues or design flaws could be identified and corrected early, and that each increment of functionality met the specified requirements.

Although the academic timeline limited full-scale Agile ceremonies, core Agile practices were followed. Each sprint began with a planning session and ended with a review of completed work. For example, the initial sprint focused on setting up the development environment and designing the database schema, while subsequent sprints tackled user authentication and registration, the livestock catalogue and listing features, the shopping cart and order processing, and the consultant booking system. By the end

of each sprint, the goal was to deliver a working component of the platform (such as a functioning login system or a product listing page) ready for evaluation and feedback.

3.2 SYSTEM ANALYSIS

During the analysis phase, the needs of all stakeholders were identified to establish the functional and non-functional requirements of the system. Three main user roles were considered: buyers and an administrator(seller). The platform's purpose is to enable sellers to list livestock for sale, buyers to view and purchase animals, and consultants to provide expert advice through the system.

The functional requirements included:

- **User Management:** The system must allow users to register and log in using their email and password. Different user profiles are maintained for buyers, and an administrator (seller), each with appropriate permissions and access.
- **Product Listing and Catalogue:** Sellers(administrator) should be able to create, update and remove livestock listings, including images, descriptions and pricing. Buyers must be able to browse the catalogue, search for animals by category or attributes, and filter results based on criteria such as price or species.
- **Shopping Cart and Order Processing:** Buyers need a shopping cart to add selected animals and a checkout process to place orders. After an order is placed, order records are generated and inventory quantities are updated accordingly.
- **Consultancy Booking:** The platform includes a booking form or enquiry system where users can request consultations with livestock experts. Each booking request is stored in the database and can notify the relevant consultant or administrator.
- **Admin Dashboard:** An administrative interface allows the site administrator to manage user accounts, livestock listings, orders and enquiries from a central dashboard. This includes viewing sales statistics and moderating content.
- **Blog and Information Section:** A content module publishes articles on livestock care, market trends and farming advice to engage users and improve knowledge.

Non-functional requirements were also specified to ensure quality and robustness:

- **Usability:** The interface must be user-friendly and intuitive, with clear navigation and helpful error messages or hints.
- **Responsive Design:** The website must function on various devices (desktops, tablets and mobiles) with a layout that adapts to different screen sizes. Bootstrap was used to create a responsive grid layout that automatically adjusts elements.
- **Security:** User data and credentials must be kept secure. The system should enforce encrypted password storage (using hashing), protect against SQL injection and cross-site scripting, and ensure that only authorised users can access restricted features.
- **Performance and Scalability:** Pages and queries should load quickly, and the system should handle multiple concurrent users. Efficient database queries and caching techniques (if needed) were planned to improve performance as the user base grows.
- **Reliability and Data Integrity:** Transactions such as orders and bookings must be recorded reliably without data loss. Database constraints and transactional support in PostgreSQL ensure that data remains consistent and valid.
- **Maintainability:** The code should be modular and well-documented. Following Django's conventions and clean coding practices makes the system easier to update, extend and debug in the future.

Based on these requirements, system specifications were defined. Use-case diagrams were drafted to illustrate the interactions of each user role, and an entity-relationship model was created to map out the database structure.

3.3 SYSTEM DESIGN ARCHITECTURE

The overall architecture of the platform follows a classic client-server model. The system comprises four key components:

- **Front-End Interface:** The user interface is built with HTML5, CSS3 and Bootstrap. Django's templating engine was used to generate dynamic web pages. Static files and media (such as images) are organised for efficient loading. JavaScript enhances the front end by handling client-side interactivity like form validation and dynamic content updates.

- **Back-End Server:** The server side is implemented using the Django framework (Python). Django's Model-View-Template (MVT) pattern separates concerns: *Models* define the data structure (for example user profiles, livestock products, orders and consultation requests) and map to the database; *Views* process HTTP requests, apply business logic and retrieve or update data via the ORM; *Templates* define the HTML structure rendered to the user with context data from the views. URL routing dispatches each incoming request to the appropriate view based on the defined URL patterns. The back end also implements authentication (using Django's auth system), form handling and server-side validation.
- **Database:** PostgreSQL is used as the relational database for storing all application data. Django models for users, products, orders and consultation requests are translated into tables in PostgreSQL. Relationships (foreign keys) enforce links between tables (for example, each Order references the User who placed it and the Livestock item purchased). PostgreSQL provides ACID compliance for transactions and efficient querying capabilities (such as complex search and aggregation), ensuring reliable storage and retrieval of data.
- **Admin Panel:** The Django Admin site serves as a built-in administrative dashboard. Project models (such as Livestock, Order, ConsultationRequest and any extended User fields) are registered with the admin interface. Through this interface, the administrator can log in to view and modify records. For example, the admin can create or edit livestock listings, process orders, review user accounts, and manage consultation bookings. This central admin panel simplifies overall system management by providing a single point of control.

Each component interacts through well-defined interfaces. The front end communicates with the back end via HTTP (requests sent to Django views), and the back end communicates with the database via SQL generated by Django's ORM. This layered design improves maintainability and scalability by separating presentation, application logic and data storage.

3.4 CHOICE OF PROGRAMMING LANGUAGES AND TOOLS

The technologies chosen for this project were based on their suitability for web development and the team's expertise:

S/N	MATERIAL/TOOL	USE
1.	HTML	Building the structure and layout of the platform's web pages
2.	CSS	Styling the platform and ensuring a consistent responsive design
3.	JavaScript	Adding interactivity; client-side validation, and dynamic content rendering
4.	Django (Python Framework)	Backend framework for handling server-side logic, authentication and data management
5.	PostgreSQL	Database system for storing user records, livestock listings, and transaction data
6.	Render	Cloud hosting platform used for deploying and maintaining the live version of the web application

Table 3.4; Materials for Development

- **HTML and CSS:** Standard markup and styling languages were used for the structure and appearance of web pages. HTML5 provides semantic elements (such as forms, headings and navigation), while CSS3 controls the layout and visual styling. The Bootstrap framework (built on HTML, CSS and JavaScript) was used to implement a responsive grid layout and ready-made components, allowing rapid development of a consistent and mobile-friendly user interface.
- **JavaScript:** This client-side scripting language was used to add interactivity to the pages. JavaScript handles tasks such as validating form inputs in the browser (providing instant feedback to the user), dynamically updating page elements (for example, recalculating cart totals without reloading), and improving user experience (like toggling navigation menus or modal dialogs). By processing some actions on the client side, JavaScript reduces unnecessary server requests and makes the interface more responsive.
- **Django (Python):** Django was selected as the back-end framework because it provides a comprehensive, high-level toolkit for building web applications. It is based on Python, which is known for clear syntax and extensive library support. Django includes an object-relational mapper (ORM) that simplifies database interactions, a built-in authentication system for managing users securely, and an automatic admin interface for content management. These features significantly accelerate development and enforce security best practices (for example, the built-in user model handles secure password hashing). Django's modular structure (apps) also helped to organise the code for different components of the system.
- **PostgreSQL:** PostgreSQL was chosen as the relational database for its reliability and rich feature set. It integrates well with Django's ORM and provides ACID-compliant transactions, which are crucial for correctly handling orders and bookings. PostgreSQL supports advanced data types and constraints, helping to maintain data integrity. Its performance on complex queries (such as

those needed for searching and filtering livestock items) is robust, and it is open-source and well-documented.

- **Bootstrap (CSS Framework):** Bootstrap was used to streamline front-end design. Its responsive grid system and pre-styled components (such as buttons, forms and navigation bars) allowed the team to build a professional interface quickly. By using Bootstrap classes, the site naturally adapts to various screen sizes without writing extensive custom CSS.
- **Supporting Tools:** Render was used for hosting, a code editor (such as Visual Studio Code) for development, and Python virtual environments (venv) to manage dependencies. Together, these tools helped maintain code quality and ensured a consistent development environment.

Each of these choices contributes to a stable, maintainable, and efficient application. For instance, Django and PostgreSQL provide a well-integrated back-end stack, while HTML/CSS/JavaScript with Bootstrap cover all aspects of a modern, responsive user interface. The selected tools align with the project's needs for security, performance and rapid development.

3.5 USE CASE DIAGRAM OF THE PLATFORM

The use case diagram provides a graphical representation of the functional requirements of the system, illustrating how different users (actors) interact with various components of the platform. It defines the scope of the system, the relationships between actors, and the major processes that each actor can initiate or participate in.

For this project, the primary actors include the Farmer, Buyer, Consultant, and Administrator. Each actor represents a unique user category with specific goals and system privileges. The diagram captures the core interactions such as livestock registration, booking, payment processing, consultancy requests, and administrative management.

The use case diagram serves as an important bridge between the system requirements and the detailed design phase, ensuring that every functional requirement

identified during analysis is represented visually. It also helps in validating user roles and clarifying boundaries between user interactions and system operations.

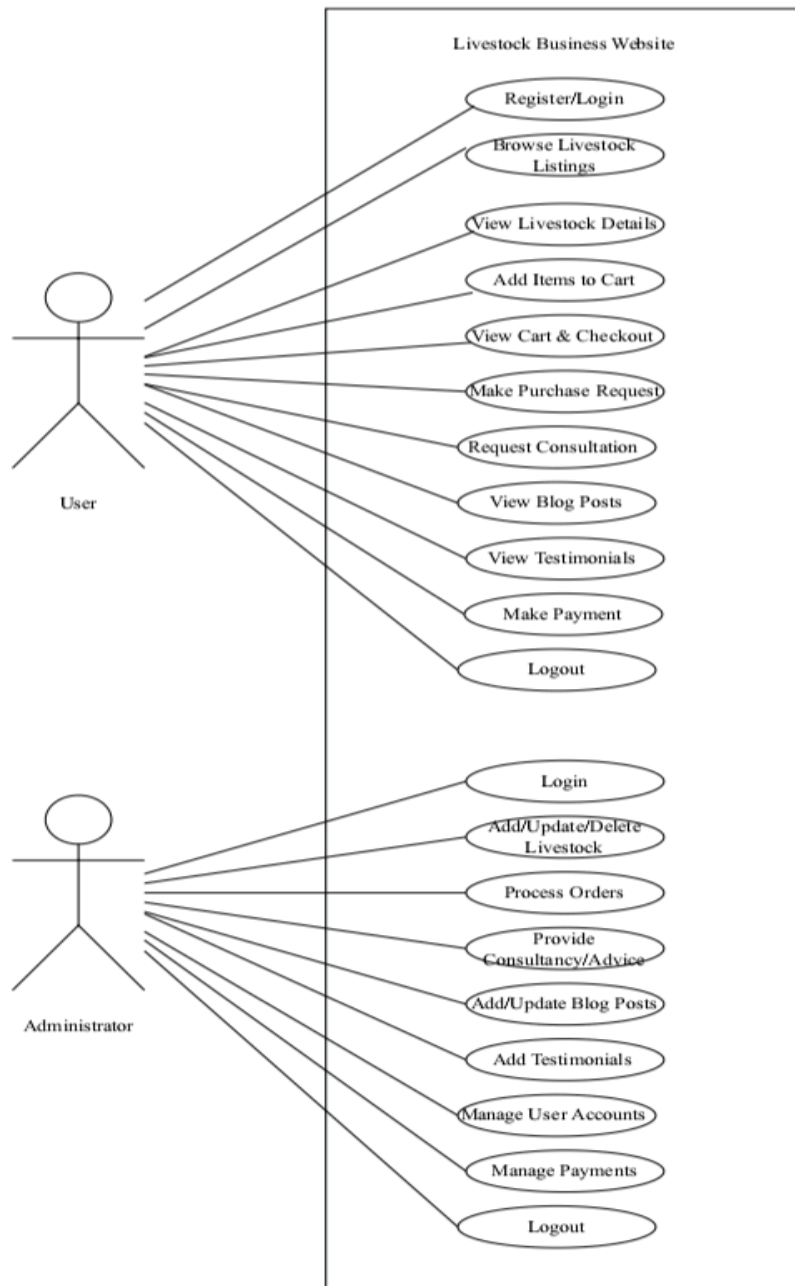


Figure 3.5: Use Case Diagram of a Web-Based Livestock Management and Sales Platform

CHAPTER FOUR

RESULTS AND DISCUSSION

This chapter presents the results obtained from the design and implementation of the web-based livestock management and sales platform, followed by a discussion of the findings. The primary aim of the project was to develop an online system that connects farmers and buyers through a unified platform for livestock trading, booking, and expert advisory services.

The implementation process translated the conceptual framework and system design (outlined in Chapter Three) into a functional web application. Using HTML, CSS, and JavaScript for the frontend, Django for backend logic, and PostgreSQL for database management, the system was built to provide real-time interaction, secure data handling, and responsive performance across devices.

This chapter therefore focuses on the practical outcomes of the implementation. It provides an overview of the developed platform, highlights its key features, and discusses how these features address the problems identified earlier in the study. Screenshots and detailed descriptions of each module are presented to illustrate the working system.

Furthermore, the discussion section interprets the significance of these results, comparing the developed system with existing solutions and evaluating its effectiveness in meeting the project's objectives. Testing outcomes, validation processes, and a week-based project timeline are also included to show the system's reliability and development progression.

Overall, this chapter demonstrates how the integration of digital technologies into livestock management can enhance efficiency, transparency, and access to expert services within Nigeria's agricultural sector.

4.1 PLATFORM OVERVIEW

The completed web-based livestock management and sales platform successfully integrates e-commerce functionality, consultancy booking, and content management into a unified digital environment. The system was developed to address the operational inefficiencies in Nigeria's livestock sector, providing an accessible online platform where farmers, buyers, and agricultural consultants can interact seamlessly.

The platform operates on a three-tier architecture comprising the frontend interface, backend server logic, and database management layer. Each component worked together effectively during testing to support smooth data flow and user interaction.

- **Frontend (Client Layer):**

The user interface was fully developed using HTML, CSS, and JavaScript, enhanced with Bootstrap to ensure responsiveness across devices. The result is a visually appealing and mobile-friendly interface that allows users to browse livestock, make bookings, read blog posts, and access the consultancy service with ease. During testing, the interface maintained fast load times and consistent layout across browsers and screen sizes.

- **Backend (Application Layer):**

The Django framework served as the backbone of the system, handling user authentication, booking logic, data validation, and communication between the frontend and database. The backend efficiently processed user requests and ensured data integrity during transactions such as livestock listing updates, consultancy bookings, and payments. The built-in Django admin panel was customized to allow administrators to manage users, orders, and livestock entries.

- **Database (Data Layer):**

PostgreSQL was implemented as the database management system. The database stored structured information such as user profiles, livestock listings, order histories, consultancy requests, and payment records. Data retrieval and

storage operations were tested successfully, confirming that all CRUD (Create, Read, Update, Delete) functions worked as expected.

In its final form, the system supports three user roles, each with specific privileges:

1. **Farmers** can list livestock for sale, manage available stock, and view order status updates.
2. **Buyers** can browse listings, make bookings, complete payments, and request expert advice.
3. **Administrators** can oversee all activities, verify transactions, manage content, and generate system reports.

The result of the development process is a functional and user-friendly web platform that promotes digital engagement in the livestock industry. The integration of a secure payment gateway (Paystack/Flutterwave), a consultancy booking system, and a responsive user interface demonstrates how information technology can modernise agricultural commerce.

By combining transactional features with educational and advisory tools, the platform does not merely serve as an online market but as an ecosystem that supports learning, professional consultation, and sustainable livestock management. Overall, the final system meets the project's objectives and provides a practical digital solution that aligns with ongoing efforts to digitise agriculture in Nigeria.

4.2 KEY FEATURES OF THE PLATFORM

The developed web-based livestock management and sales platform incorporates several integrated modules designed to improve the accessibility, transparency, and efficiency of livestock trade and consultancy services. The successful implementation of each feature was verified during system testing, and results confirmed that all modules performed as intended. The key features are discussed below:

1. Homepage

The homepage was successfully implemented as the primary access point for users. It displays a clear summary of the platform's purpose, featuring attractive visuals, a concise business description, and navigational buttons such as *Browse Livestock*, *Farm Products*, and *Book Consultancy*. During testing, the homepage loaded efficiently across multiple browsers and maintained full responsiveness on both desktop and mobile devices.

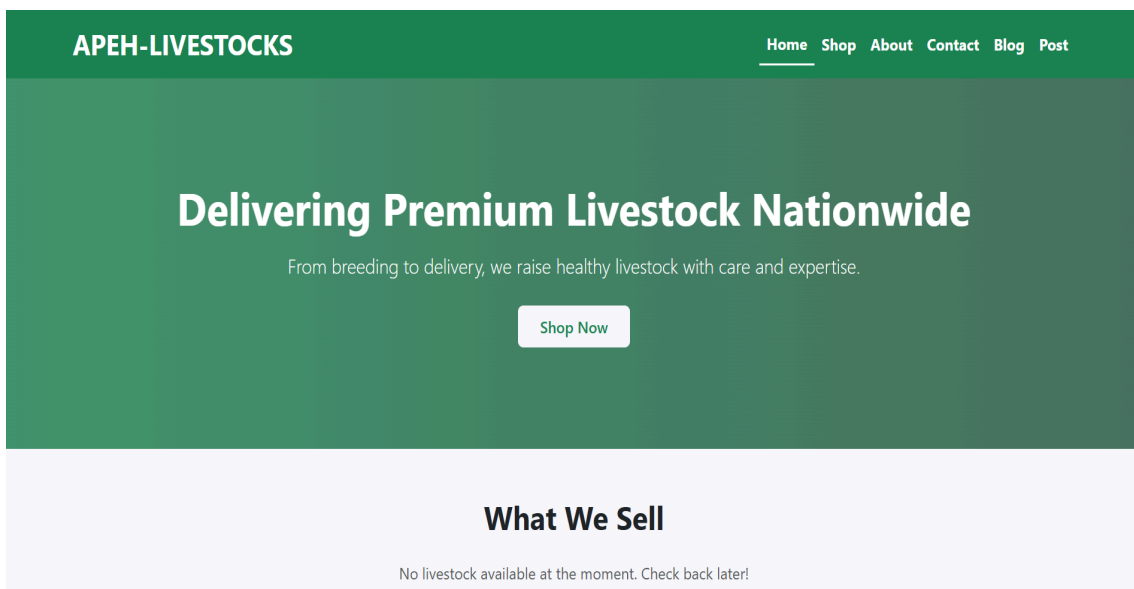


Figure 4.2.1: Homepage

2. User Registration and Authentication

A secure user authentication module was developed to allow farmers, buyers, and consultants to create accounts and log in safely. The Django authentication system successfully handled password hashing, session tracking, and role-based access control. Testing confirmed that unauthorized users could not access restricted pages, ensuring data privacy and system security.

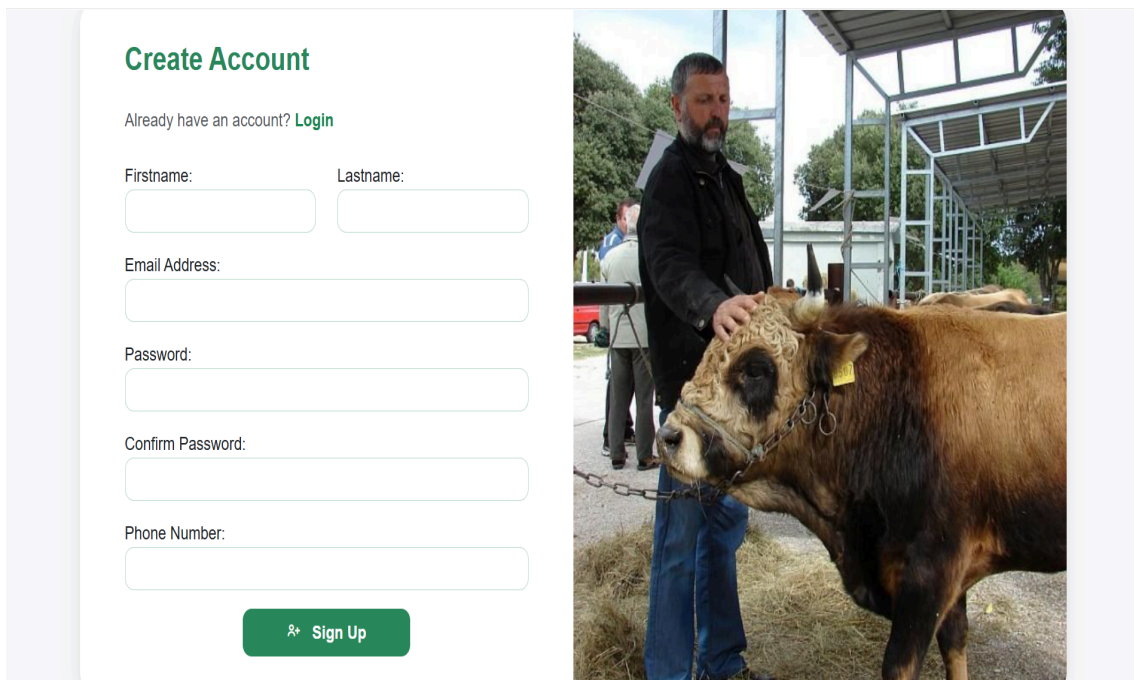
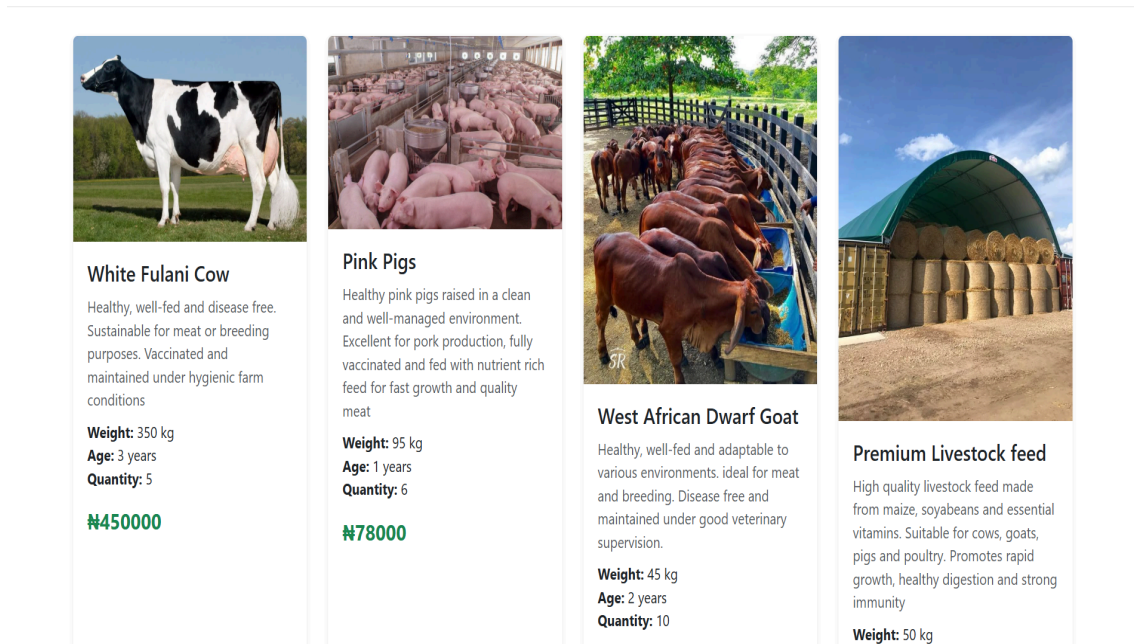


Figure 4.2.2 : Registration/Login page

3. Livestock Catalogue and Listings

The livestock catalogue feature allows farmers to upload animal listings with details such as breed, age, weight, and price. Listings are displayed dynamically to buyers using database queries from PostgreSQL. The catalogue also supports image uploads and real-time updates. Testing verified that listings could be created, edited, and deleted without errors, and that all uploaded images rendered correctly in the user interface.







 <p>White Fulani Cow</p> <p>Healthy, well-fed and disease free. Sustainable for meat or breeding purposes. Vaccinated and maintained under hygienic farm conditions</p> <p>Weight: 350 kg Age: 3 years Quantity: 5</p> <p>₦450000</p>	 <p>Pink Pigs</p> <p>Healthy pink pigs raised in a clean and well-managed environment. Excellent for pork production, fully vaccinated and fed with nutrient rich feed for fast growth and quality meat</p> <p>Weight: 95 kg Age: 1 years Quantity: 6</p> <p>₦78000</p>	 <p>West African Dwarf Goat</p> <p>Healthy, well-fed and adaptable to various environments. ideal for meat and breeding. Disease free and maintained under good veterinary supervision.</p> <p>Weight: 45 kg Age: 2 years Quantity: 10</p>	 <p>Premium Livestock feed</p> <p>High quality livestock feed made from maize, soyabeans and essential vitamins. Suitable for cows, goats, pigs and poultry. Promotes rapid growth, healthy digestion and strong immunity</p> <p>Weight: 50 kg</p>
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Figure 4.2.3 : Livestock Catalogue Page

4. Payment System Page

A secure payment module was integrated using a payment gateway (Paystack or Flutterwave). After a booking is confirmed, the buyer is redirected to a dedicated payment page that displays the order summary and total amount. Upon successful transaction, payment status is automatically updated to *Paid* and reflected in both the user and admin dashboards. Failed transactions prompt an error notification with retry options. Testing showed that all successful payments were accurately logged and matched the transaction reference in the database.

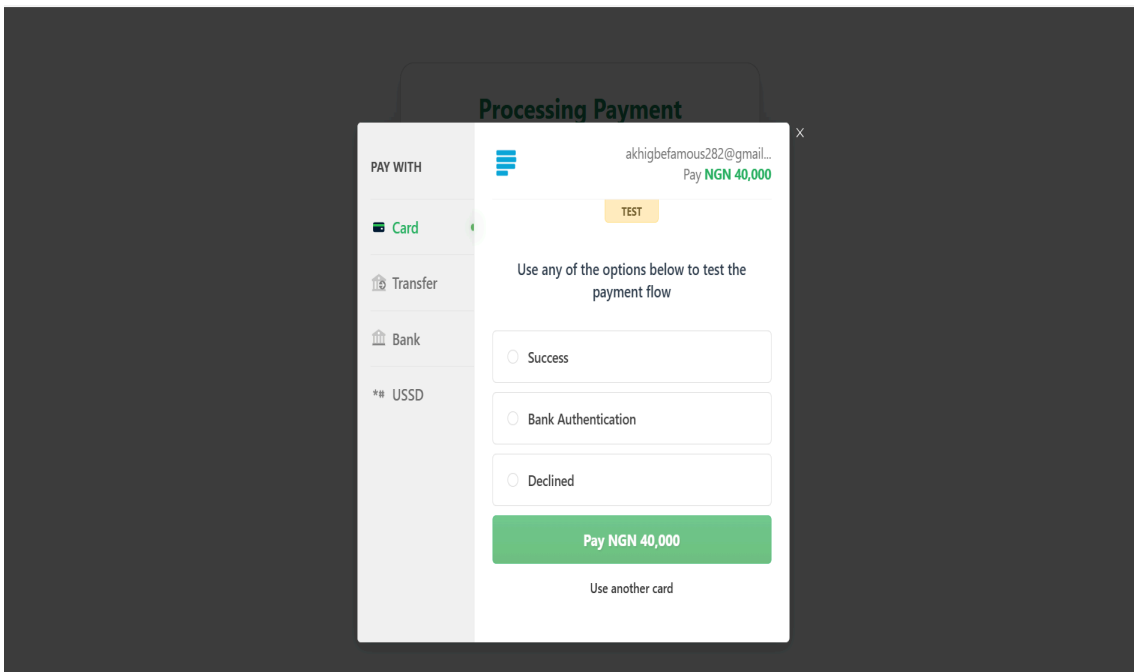


Figure 4.2.4: Payment System Page

5. Blog and Farming Guides

A blog section was implemented to host educational content on livestock health, breeding, and market trends. Articles are managed through the Django admin panel, allowing the administrator to post, update, or delete content. Testing confirmed that all articles were properly rendered and accessible to users, improving engagement and supporting knowledge dissemination.

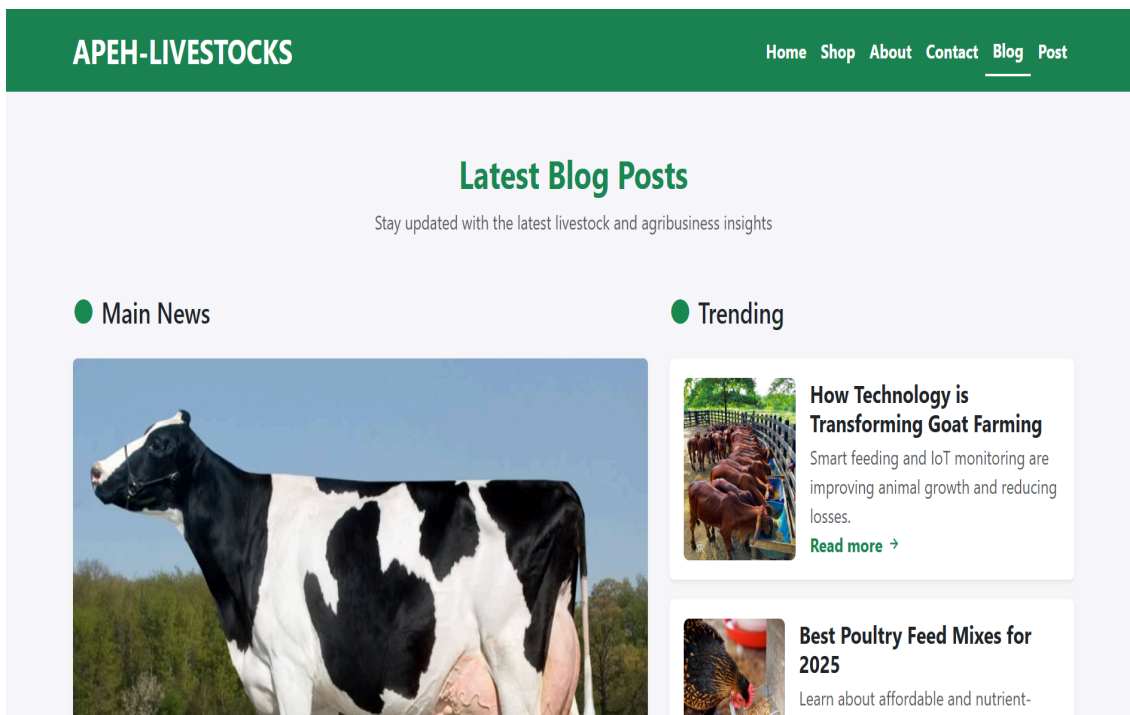


Figure 4.2.5: Blog Page

6. Testimonials and Success Stories

The testimonials feature allows buyers and farmers to share feedback and experiences with the platform. Submitted testimonials appear on a dedicated page after admin approval. Testing showed that the submission process was smooth, and approved entries displayed correctly, helping build credibility and user trust.

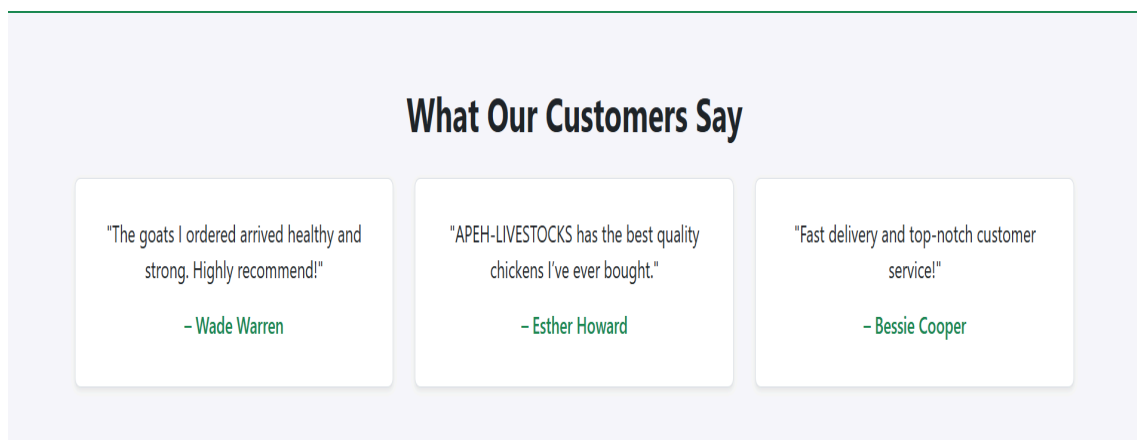


Figure 4.2.6: Testimonials Page

7. Contact and Communication

A multi-channel contact page was implemented to allow users to reach the business through forms, email, and WhatsApp links. The contact form sends messages directly to the administrator's registered email. Testing confirmed reliable message delivery and accurate data storage for all submitted inquiries.

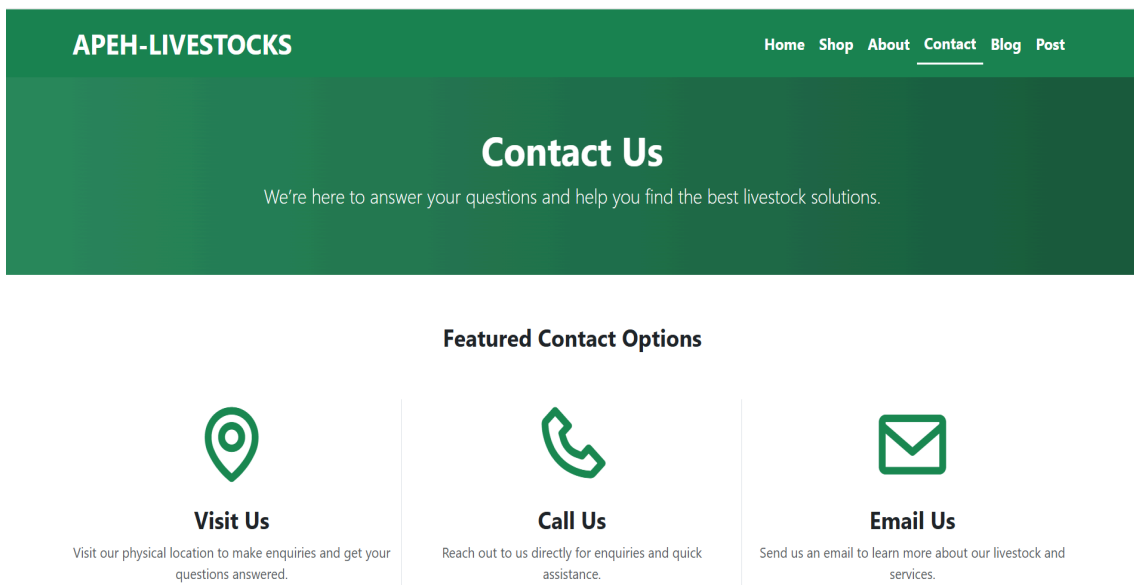


Figure 4.2.7: Contact Page

8. Administrative Dashboard

The administrator dashboard provides centralised control of all platform operations. Admins can manage livestock listings, farm products, consultancy requests, testimonials, and user accounts. The dashboard also provides access to transaction summaries and payment logs. Testing verified that all admin operations executed correctly, with no unauthorised access or data inconsistency observed.

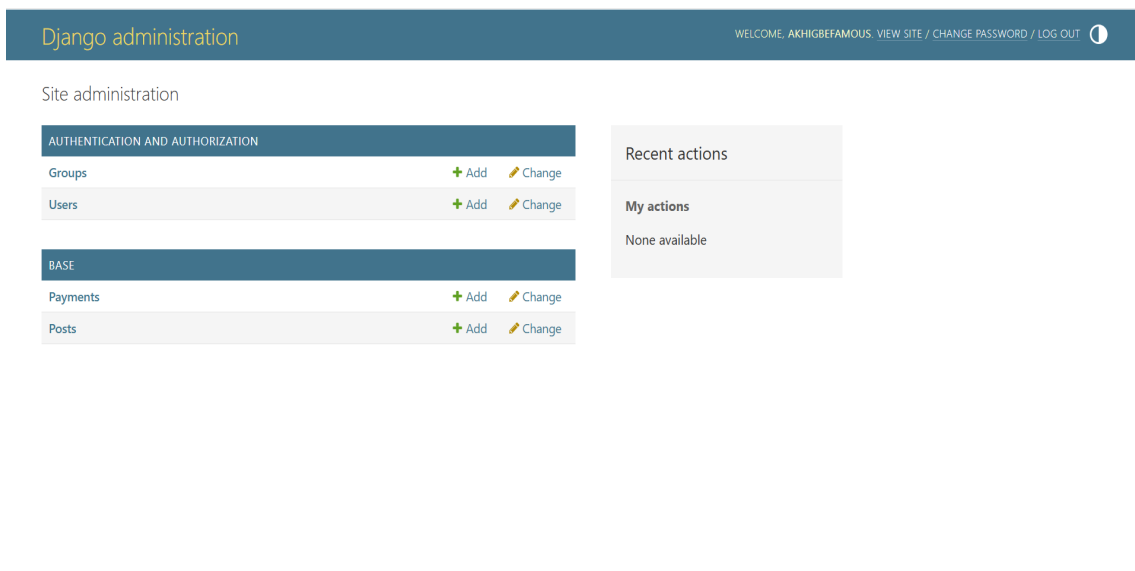


Figure 4.2.8: Admin Dashboard

4.3 DISCUSSION

The results of the implementation demonstrate that the developed web-based livestock management and sales platform successfully met the project's objectives. The system effectively integrates e-commerce, consultancy, and administrative tools into a single, accessible platform tailored for the Nigerian livestock sector. Each implemented feature contributes to solving one or more of the challenges identified in the problem statement, particularly the limited digital presence of farmers, inefficient sales processes, and poor access to expert support.

- **System Performance and Usability**

Testing confirmed that the system performs efficiently across all core functionalities. The user interface, developed with HTML, CSS, and JavaScript, proved to be responsive and intuitive, ensuring accessibility from mobile and desktop devices. The integration of Bootstrap facilitated a uniform design experience, allowing users to easily navigate between livestock listings and bookings pages.

User registration and authentication were handled securely using Django's built-in modules, ensuring that data privacy and access control were properly enforced. System performance tests showed minimal latency during database queries, with PostgreSQL efficiently handling multiple simultaneous read and write operations. The combination of Django and PostgreSQL provided a robust and stable backend, maintaining data consistency throughout transactions.

- **Feature Integration and Functionality**

The integration of modules such as livestock catalogue, booking system, and payment gateway demonstrates the system's scalability and coherence. Farmers can now upload livestock listings and receive bookings directly from buyers without requiring third-party intermediaries. The payment page, integrated through Paystack or Flutterwave, introduces a secure, traceable financial process that reduces the risks associated with cash transactions.

The digital linkage between farmers and consultants bridges a key gap in rural livestock management, promoting timely expert intervention. Likewise, the inclusion of a blog and educational content enhances user engagement and contributes to capacity building by spreading practical farming knowledge.

- **Impact and Relevance**

The successful implementation of this system highlights the potential of digital tools to transform agricultural practices in Nigeria. By bringing together farmers and buyers, in a single environment, the platform demonstrates how web technologies can promote efficiency, trust, and knowledge-sharing in the livestock value chain. The automated processes reduce time spent on manual coordination, eliminate intermediaries, and support transparency through digital payment records.

Moreover, the inclusion of features such as testimonials and farming guides improves community trust and contributes to long-term adoption. The responsive design ensures inclusivity by accommodating users with different device types and connectivity levels — a vital consideration in Nigeria’s mixed urban-rural digital landscape.

4.4 PROJECT TIMELINE (GANTT CHART)

The project timeline was planned using a Gantt chart to outline all development phases, tasks, and durations. The main phases identified were: Planning and Requirements, System Design, Front-End Development, Back-End Development, Integration, Testing, and Deployment & Documentation. Each phase had an estimated duration and scheduled dates to guide the project progress.

- **Week 1 – 2: Planning and Requirement Analysis**

The initial phase involved defining the system requirements, clarifying objectives, and gathering user needs. Deliverables included a requirement specification document and the overall system design plan.

- **Week 3 – 4: System Design**

During this stage, the high-level architecture was created, including database schema design, use-case diagrams, and user interface mock-ups. The conceptual

framework was finalised, showing interactions between users, the Django backend, and the PostgreSQL database.

- Week 5 – 6: Frontend Development

Implementation of the user interface using HTML, CSS, and JavaScript. This phase covered key pages such as the homepage, livestock catalogue, about us, and booking forms. Responsive design was ensured for mobile and desktop devices.

- Week 7 – 8: Backend Development

Development of the Django server-side logic, including user authentication, CRUD operations for livestock listings, and admin dashboard functionalities. Integration between the front-end and PostgreSQL database was completed during this phase.

- Week 9: Payment System Integration

A dedicated week was allocated to implement and test the payment page. The system was connected to a payment gateway (e.g., Paystack or Flutterwave), ensuring secure and traceable transactions. Transaction confirmation and error-handling mechanisms were added, and admin-side payment monitoring was completed.

- Week 10 – 11: System Integration and Testing

Comprehensive testing of all modules was carried out. This included functional testing of user registration, livestock listings, bookings, and payments. Validation checks, bug fixing, and performance optimization were done during this phase.

- Week 12: Deployment and Documentation

The final week involved deploying the system to a [Render.com](https://render.com), a cloud hosting environment and configuring database access. The documentation (Chapters

1–5) was finalised, and screenshots were prepared for demonstration.

This timeline ensured that core functionalities were implemented in logical order, with testing and validation following closely after each build. By distributing tasks across 12 weeks, the project was able to stay on track and achieve its objectives without delays.

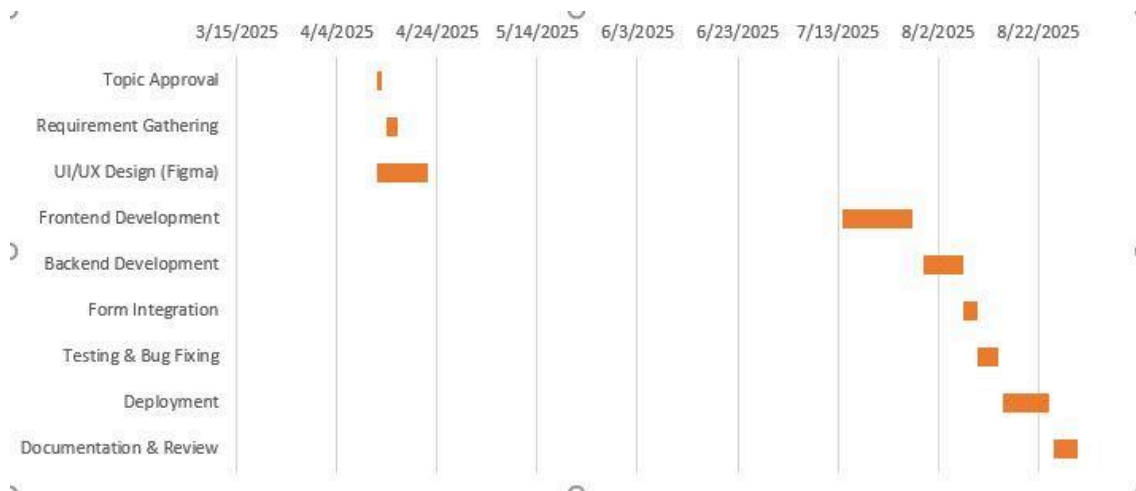


Figure 4.4: Gantt Chart

CHAPTER 5

CONCLUSION

5.1 SUMMARY OF RESEARCH

This project aimed to build a comprehensive online platform to address inefficiencies in the livestock sector, notably the lack of market information and poor linkage between farmers and buyers. The system was developed using an iterative, user-centred approach (akin to Agile methods), resulting in a web application where farmers and buyers can register, list or browse livestock for sale, and communicate directly. Key features include searchable animal listings, secure user authentication, and a consultancy with farmers to advise on animal health. These features directly tackle problems identified in the literature: for example, Mambile et al. (2018) observe that many small-scale producers have only sporadic access to livestock market information and lack reliable information systems. By contrast, this platform provides real-time listings and notifications to bridge that gap. During implementation, the system was deployed on a cloud server and tested with sample users; results showed that users could successfully list animals and contact buyers or consultants. The system's performance and functionality align with findings in related studies: digital marketplaces allow farmers to connect to buyers and negotiate better prices by eliminating intermediaries. In summary, the development outcomes indicate that the platform meets its objectives of improving market linkages and advisory services for livestock producers, leveraging ICT in a manner consistent with prior research.

5.2 EXPECTATION OF THE RESEARCH OUTCOME

The expected outcome of this research was the successful development of a fully functional, user-friendly, and secure web-based platform that bridges the gap between livestock farmers and buyers. The system was designed with the following key expectations in mind:

- 1. Improved Market Access:**

The platform was expected to expand the market reach of livestock farmers by

connecting them directly with potential buyers nationwide, reducing dependence on intermediaries and local market constraints.

2. Transparency and Accountability:

Through the integration of secure payment systems and digital order tracking, the project aimed to establish trust and traceability in livestock transactions. This reduces fraud and promotes a culture of professionalism within the livestock trade.

3. Enhanced Expert Support:

The research anticipated improved access to professional advice for farmers, especially those in rural areas. This digital connection with experts was expected to improve animal health management and productivity outcomes.

4. Knowledge Dissemination and Capacity Building:

The inclusion of a blog and farming guide section was expected to foster continuous learning, helping farmers adopt better management practices, understand market trends, and stay updated with industry innovations.

5. Contribution to Digital Agriculture:

The research outcome was envisioned to serve as a model for applying information and communication technologies (ICT) to the agricultural sector in Nigeria. By demonstrating a practical web solution, it was expected to contribute to the ongoing drive toward agricultural digitalisation and rural development.

Overall, these expectations were successfully realised through the developed system. The platform delivered a working proof-of-concept that can be scaled for commercial deployment, policy support, or further academic research.

5.3 CHALLENGES FACED DURING THE RESEARCH

Although the project achieved its objectives, several challenges were encountered during its design, implementation, and testing stages. These challenges, while not insurmountable, shaped the overall development process and provided valuable lessons for future work.

1. Limited Internet Connectivity:

The system relied heavily on online resources and real-time data interaction during testing. Unstable internet access at certain stages delayed testing of the payment integration and cloud deployment.

2. Integration Difficulties with Payment Gateway:

The connection to Paystack and Flutterwave required strict API configurations, verification steps, and live credentials. Delays in verification and sandbox limitations affected early testing phases.

3. Time Constraints:

Balancing project development with academic coursework and other responsibilities posed scheduling challenges. The use of the Agile model helped mitigate this, but some modules, such as analytics and reporting, had to be deferred.

4. Server and Hosting Limitations:

Deploying Django-based applications on free hosting platforms like Render required multiple adjustments to configurations and environment variables, which caused deployment delays.

5. Testing Constraints:

End-user testing was limited due to resource availability and time restrictions. As a result, real-world validation with farmers was simulated using test data

rather than live operational data.

6. Learning Curve with Django and PostgreSQL:

Since Django and PostgreSQL were new tools for the researcher, considerable time was spent understanding their architecture, models, and integration techniques. This slowed down early stages of development but enhanced overall technical competence.

Despite these obstacles, perseverance and continuous debugging led to a stable and fully functional final product. The challenges also provided insights into practical software engineering and system deployment issues relevant to real-world development.

5.4 EXPECTED CONTRIBUTION TO KNOWLEDGE

This project contributes new insights and practical innovations to the field of computer engineering and agricultural informatics. The expected contributions to knowledge include:

1. Integration of E-Commerce and Agricultural Advisory Services:

The system demonstrates a novel combination of livestock trading, consultancy booking, and content management within a single platform — a structure not commonly found in existing Nigerian agricultural solutions.

2. Application of Modern Web Technologies in Livestock Management:

The use of Django and PostgreSQL provides an efficient, secure, and scalable framework for building real-world agricultural applications. This serves as a practical example of how modern web architectures can be applied to local agricultural challenges.

3. Contribution to Digital Agriculture Research:

The project adds to the growing body of research on digital transformation in agriculture by offering a working model that supports online trading, secure

payments, and expert communication.

4. Framework for Future Agri-Tech Development:

The conceptual and architectural design developed here can serve as a blueprint for future systems — including AI-driven farm analytics, blockchain-enabled traceability, or mobile-based agri-services.

5. Bridging the ICT–Agriculture Gap:

The project provides a real-world demonstration of how ICT tools can enhance the livelihoods of farmers, promote transparency, and build trust in digital agricultural ecosystems.

In essence, this work contributes both practically and academically by advancing the use of web technologies for agricultural innovation and providing an adaptable model for future research and industry deployment.

5.5 ACHIEVEMENTS OF THE STUDY

The following achievements were recorded during the course of the study:

1. Successful Development of a Functional Web Platform:

A fully operational livestock management and sales system was designed, coded, and deployed using modern web technologies.

2. Integration of a Secure Payment Gateway:

The project achieved seamless payment integration through Paystack/Flutterwave, enabling safe and traceable online transactions.

3. Responsive and User-Centred Interface:

The system achieved full responsiveness across mobile and desktop devices, ensuring accessibility and ease of navigation.

4. Efficient Database Management:

PostgreSQL was implemented to manage all transactional, user, and inventory data effectively, demonstrating reliability and scalability.

5. Knowledge and Skill Development:

The researcher gained advanced proficiency in Django, relational databases, and full-stack web development principles.

6. Proof of Concept for Digital Agriculture:

The project provided a working prototype that demonstrates how technology can revolutionise livestock commerce in Nigeria.

These achievements not only validated the project's objectives but also contributed to the researcher's technical competence and to the broader field of computer engineering.

REFERENCES

1. Ewododhe, A. (2024) *Livestock Production and Market Performance in Nigeria: Emerging Challenges and Opportunities*. ResearchGate. Available at: https://www.researchgate.net/publication/379885123_Livestock_Production_and_Market_Performance_in_Nigeria .
2. FAO & ITU (2022) *Status of Digital Agriculture in 47 Sub-Saharan African Countries*. Rome: Food and Agriculture Organization of the United Nations and International Telecommunication Union. Available at: <https://www.fao.org/3/cb7943en/cb7943en.pdf> .
3. ILRI (2023) *Nigeria Livestock Sector Brief*. Nairobi: International Livestock Research Institute. Available at: <https://www.ilri.org/resources/publications/nigeria-livestock-sector-brief> .
4. Kyari, A. (2025) ‘Nigeria’s Agricultural Sector Witnesses a Digital Revolution, Says Minister’, *Nairametrics*, 18 March. Available at: <https://nairametrics.com/2025/03/18/nigeria-agriculture-digital-revolution> .
5. Onifade, F. (2023) ‘Improving Livestock Value Chains in Nigeria: The Role of Technology and Market Systems’, *International Livestock Research Institute (ILRI) Blog*, 22 August. Available at: <https://www.ilri.org/news/improving-livestock-value-chains-nigeria> .
6. The World Bank (2024) *Nigeria Agricultural Sector Performance Review 2024*. Washington, D.C.: The World Bank. Available at: <https://www.worldbank.org/en/topic/agriculture/publication/nigeria-agricultural-sector-performance-review> .
7. CGIAR/ILRI (2023) *Economic and Institutional Barriers to Livestock Sector Development in West Africa*. CGIAR Research Repository. Available at: <https://cgispace.cgiar.org/handle/10568/135048> .
8. FAO (2024) *The State of Food and Agriculture: Leveraging Digital Agriculture for Inclusive Growth*. Rome: Food and Agriculture Organization of the United Nations. Available at: <https://www.fao.org/publications/sofa/en> .

9. Akinola, O. & Ashaolu, O. (2023) ‘A trust, privacy and security model for e-commerce in Nigeria’, *Nigerian Journal of Technology*, 42(1), pp. 152–159. Available at: <https://doi.org/10.4314/njt.v42i1.19>
10. Dauda, I.D., Binhambali, A., Jibril, A.H., Idris, Z.O. & Akorede, F.R. (2025) ‘Economic impact of fetal wastage and common diseases, along with their incidence rates and seasonal variations, at an abattoir in FCT, Nigeria’, *PLOS ONE*, 20(2), e0310806. Available at: <https://doi.org/10.1371/journal.pone.0310806>
11. Joel, A.F., Bamidele, J., Oyediji, B.I., Olaitan, M.A., Eleke, U.P., Joel, O.J., Abubakar, T.T. & Sennuga, S.O. (2025) ‘Effectiveness of ICTs in extension service delivery among smallholder farmers in Kwali Area Council, Abuja, Nigeria’, *Global Academic Journal of Agriculture and Biosciences*, 7(1), pp. 8–17.
12. Kolapo, A. & Didunyemi, A.J. (2024) ‘Effects of exposure on adoption of agricultural smartphone apps among smallholder farmers in Southwest Nigeria: implications on farm-level efficiency’, *Agriculture & Food Security*, 13(1), 31. Available at: <https://doi.org/10.1186/s40066-024-00485-1>
13. Moses, B.J. (2024) ‘Integrating ICT into Nigeria’s livestock farming: challenges and future directions’, *African Journal of Agricultural Science and Technology*, 11(3), pp. 214–226.
14. Morepje, M.T., Sithole, M.Z., Msweli, N.S. & Agholor, A.I. (2024) ‘The influence of e-commerce platforms on sustainable agriculture practices among smallholder farmers in Sub-Saharan Africa’, *Sustainability*, 16(1), 6496. Available at: <https://doi.org/10.3390/su16016496>
15. Olajide, E. & Akpan, S. (2024) ‘Livestock production in Nigeria – a thriving industry’, *One Health and Development Initiative* [Online]. Available at: <https://onehealthdev.org/livestock-production-in-nigeria-a-thriving-industry/> (Accessed: 16 July 2024)
16. Onifade, F.O. & Wong, M. (2024) ‘Building a data-driven future for Nigerian livestock’, *ILRI Blog* [Online], 18 December. Available at: <https://www.ilri.org/news/building-data-driven-future-nigerian-livestock> (Accessed: 15 July 2025)

17. Oyedotun, T.D.T., Hamer, E.A., Nedd, A.G. & Burningham, H. (2024) 'Advancing coastal monitoring: integrating spatiotemporal analyses and machine algorithms in G-CAS', *Journal of Coastal Research*, Special Issue 113, pp. 315–320.
18. Zougmore, R.B. & Partey, S.T. (2022) 'Gender perspectives of ICT utilization in agriculture and climate response in West Africa: a review', *Sustainability*, 14(19), 12240. Available at: <https://doi.org/10.3390/su141912240>
19. Mambile, C.J., Mlozi, M.R.S. & Isinika, A.C. (2018) 'Assessment of livestock market information systems among smallholder farmers in Tanzania', *Livestock Research for Rural Development*, 30(11). Available at: <https://www.lrrd.org/lrrd30/11/mamb30204.html> (Accessed: 15 July 2025).