

FINAL REPORT
ON
WASTE MANAGEMENT PLAN
FOR
LIVESTOCK PRODUCTIVITY AND RESILIENCE SUPPORT
PROJECT (LPRES)



February, 2022

TABLE OF CONTENTS

TABLE OF CONTENTS	2
LIST OF TABLES.....	5
LIST OF FIGURES	5
LIST OF PLATES.....	6
EXECUTIVE SUMMARY	7
CHAPTER ONE: PROJECT BACKGROUND.....	12
1.1 Factors that Increase Livestock Productivity.....	13
1.2 Economic Importance of Livestock Production.....	13
1.3 Factors Affecting Livestock Production	14
1.4 PDO – Level Results Indicators	17
1.5 Project Locations	17
1.6 Project Components	18
1.7 Need for Waste Management Plan (WMP).....	18
1.8 Scope of Work	18
CHAPTER TWO: PROJECT DESCRIPTION.....	20
2.1. Project Components	20
CHAPTER THREE: POLICY, INSTITUTIONAL AND REGULATORY FRAMEWORK.....	32
3.1 Historical Survey of Government Objectives and Policies toward the Livestock Sub-Sector	32
3.2 Acts, Regulations and Laws Governing the Livestock Production Value Chain	34
3.2.1 Constitution of the Federal Republic of Nigeria (CFRN) of (1999)	34
3.2.2 Federal Legislation	35
3.2.3 State Legislations	36
3.2.4 Federal Regulatory Bodies	36
3.2.5 Applicable International Conventions, Treaties and Agreements	36
3.3 The Institutional Framework	37
3.3.1The Federal Ministry of Agriculture and Rural Development (FMARD)	37
3.3.2 Federal Ministry of Science and Technology (FMS&T) Parastatals	38
3.3.3 Federal Ministry of Health Parastatal	38
3.3.4 Federal Ministry of Commerce Parastatals.....	39
3.3.5 Federal Ministry of Environment (1999 Presidential Directive) and Parastatals	39
CHAPTER FOUR: STAKEHOLDERS' CONSULTATION AND ENGAGEMENT	42
4.1 Objectives of the Stakeholder Engagement Plan (SEP).....	42
4.2 Initial Consultation with stakeholders in Selected States.....	43

4.3	Follow-Up Consultation with stakeholders.....	1
CHAPTER FIVE: LIVESTOCK VALUE CHAIN AND WASTE GENERATED		2
5.1	Introduction	2
5.2	The Structure of the Meat and Milk Value Chains	5
5.3	Physical Flows of Meat and Milk among the Different Components (Actors)	6
5.4	Review of Existing Waste Management Plan Initiatives, Practices Achievements and Challenges in Nigeria	2
5.4.1	Biogas as a Sustainable Solution to Energy and Waste Management Challenges in Nigeria	3
5.4.2	Incinerators.....	7
5.4.3	Engineered landfill	7
CHAPTER SIX: IMPACT OF VETERINARY AND LIVESTOCK WASTE AND MITIGATION MEASURES		8
6.1	Non-Hazardous Waste.....	8
6.1.1	Feed Waste.....	8
6.1.2	Animal Waste.....	8
6.1.3	Animal Carcasses.....	11
6.1.4	Wastewater.....	12
6.1.5	Air Emissions	14
6.2	Hazardous Waste	16
CHAPTER SEVEN: LIVESTOCK WASTE MANAGEMENT PLAN.....		18
7.1	Waste Hierarchy	18
7.2	Waste Categories	19
7.3	General Waste Management Options Avoidance	19
7.3	Specific Waste Management Options	21
7.4	Screening checklist for future monitoring of projects.....	21
CHAPTER EIGHT: INSTITUTIONAL ARRANGEMENT		1
8.1	Project Cycle.....	1
8.2	Waste Management Monitoring Plan.....	1
8.2.2	Waste Management Monitoring Plan Schedules	5
8.2.3	Monitoring Procedure	5
8.2.4	Emergency Contingency Planning Requirements	5
8.2.5	WMP Monitoring Responsibilities.....	5
8.3	Environmental Auditing	6
8.4	Incident Reporting.....	6
8.5	Capacity Building and Training Plan	7

8.6	Implementing the WMP.....	1
8.7	Institutional arrangements	1
8.7.1	Safeguard Roles and Responsibilities of Institutions	1
	REFERENCES	3
	ANNEXES.....	4
	Methodology Used for Study.....	5
o	Initial Site Visit and Evaluation of Project Areas	5
o	Stakeholder Analysis, Identification, Mapping and Engagement	5
o	Analysis of Surveys, Concerns, Interests and Studies, Project Impacts and Reporting.....	5
	ANNEX 2 Ambient Air Quality.....	6
	ANNEX 3 Summary of World Bank Environmental/Social Safeguard Policies.....	7
	ANNEX 4 Environmental and Social Impacts General Provisions and Precautions	10
	ANNEX 5 Attendance at Pig Farmers Association Stakeholders Meeting.....	15
	ANNEX 6: Photo speak of consultations at selected states.	16
	ANNEX 7: Waste Management System Screening Checklist for Livestock Farms	19
	ANNEX 8: Stakeholder Consultation Records (2021).....	24

LIST OF TABLES

<u>Table ES 1: Summary of Potential Impacts Associated with Livestock waste</u>	Error!
<u>Bookmark not defined.</u>	
<u>Table ES 2: Waste Management Plan</u>	Error! Bookmark not defined.
<u>Table ES 3: Costs of implementing the WMP.....</u>	Error! Bookmark not defined.
<u>Table 3. 1: Average annual percentage distribution of guaranteed agricultural loans...</u>	Error!
<u>Bookmark not defined.</u>	
<u>Table 4. 1: Stakeholder Group Consultation Methods.....</u>	Error! Bookmark not defined.
<u>Table 4. 3: Stakeholders Concerns, Organisational Issues and Concerns</u>	Error! Bookmark not defined.
<u>not defined.</u>	
<u>Table 5. 1: Ruminants' existing Livestock Waste Management Cconditions</u>	1
<u>Table 5. 2: Classification of Poultry Waste and Existing Conditions</u>	Error! Bookmark not defined.
<u>defined.</u>	
<u>Table 5. 3: Benefits resulting from the use of biogas systems</u>	Error! Bookmark not defined.
<u>defined.</u>	
<u>Table 5. 4: Potential Biogas Derivable from Biomass Generated in Nigeria</u>	Error!
<u>Bookmark not defined.</u>	
<u>Table 5. 5: Estimated Biofertilizer (dry) Derivable from Biomass Generated in Nigeria</u>	Error! Bookmark not defined.
<u>defined.</u>	
<u>Table 7. 1: Specific Waste Management Plan in the Value Chain of Livestocks</u>	Error!
<u>Bookmark not defined.</u>	
<u>Table 8. 1: Livestock's Waste Management Monitoring Plan</u>	Error! Bookmark not defined.
<u>defined.</u>	
<u>Table 8. 3: Budgets for Capacity Building and Training Plan</u>	Error! Bookmark not defined.
<u>defined.</u>	
<u>Table 8. 4: Capacity Building Programme for livestock waste management.....</u>	9
<u>Table 8. 5: Costs of implementing the WMP</u>	Error! Bookmark not defined.
<u>Table 8. 6: Waste Management Responsibilities</u>	Error! Bookmark not defined.

LIST OF FIGURES

<u>Figure 5. 1: Exposure to animal faeces and/or contact with animals to human health.</u>	Error!
<u>Bookmark not defined.</u>	
<u>Figure 5. 2: F-diagram showing transmission routes of animal faeces to humans.</u>	Error!
<u>Bookmark not defined.</u>	
<u>Figure 5. 3: Structure of the beef value chain</u>	Error! Bookmark not defined.
<u>Figure 5. 5: Core functions of the beef value chain.....</u>	Error! Bookmark not defined.
<u>Figure 5. 7: Waste Generated along Milk Value Chain.....</u>	Error! Bookmark not defined.
<u>Figure 5. 8: Waste Stream Generation Points in Poultry Livestock Lifecycle</u>	Error!
<u>Bookmark not defined.</u>	
<u>Figure 5. 9: Overview of the waste management and biogas systems in livestock systems</u>	Error! Bookmark not defined.
<u>defined.</u>	
<u>Figure 6. 1: F-diagram interventions that can block human exposure to animal faeces.</u>	Error! Bookmark not defined.
<u>defined.</u>	

Figure 7. 1: Hierarchy of Waste..... **Error! Bookmark not defined.**

LIST OF PLATES

Plate 4. 1: Consultation Pictures with Plateau State Ministry of Agriculture Officials.**Error! Bookmark not defined.**

Plate 4. 2: Consultation with the Perm Sec. Ogun State Ministry of Agriculture**Error! Bookmark not defined.**

Plate 4. 3: Consultation with Animal Care Konsults – Ogun State**Error! Bookmark not defined.**

Plate 4. 4: Consultation with the Pig Farmers Association, Gberigbe, Ikorodu – Lagos**Error! Bookmark not defined.**

Plate 4. 5: Consultation with WAMASON officials.....**Error! Bookmark not defined.**

Plate 5. 1: Dairy Cattle in Integrated Farm in VOM, Plateau State.**Error! Bookmark not defined.**

Plate 5. 2: New intakes of Cattle for ranching at Animal Care Konsult, Ogun State....**Error! Bookmark not defined.**

Plate 5. 3: Pigs in Gberigbe- Ikorodu clusters**Error! Bookmark not defined.**

Plate 5. 6: Filled septic tank of wastewater within the farm.**Error! Bookmark not defined.**

Plate 5. 7: Wastewater taking over a road within the farm...**Error! Bookmark not defined.**

Plate 5. 9: Waste Generated from Grass Cutter and Rabbit Farms**Error! Bookmark not defined.**

Plate 5. 10: Different Methods of Snail Farming Practices in Nigeria**Error! Bookmark not defined.**

Plate 5. 12: Different methods of poultry farming practises in Nigeria**Error! Bookmark not defined.**

Plate 5. 13: Different methods of poultry farming practises in Nigeria.**Error! Bookmark not defined.**

Plate 5. 14: Pictures showing different types of waste generated from a poultry farms..**Error! Bookmark not defined.**

Plate 5. 15: Different types of waste generated from a poultry farms**Error! Bookmark not defined.**

Plate 5. 16: Biogas Plant underconstruction by one of the farmers**Error! Bookmark not defined.**

Plate 5. 17: Existing types of Incinerators on Livestock Farms**Error! Bookmark not defined.**

EXECUTIVE SUMMARY

ES 01. Background

The Government of Nigeria has requested the assistance of the World Bank for the preparation of the Livestock Productivity and Resilience Support Project. The Project Development Objective (PDO) is to improve the productivity of the livestock value chain and mitigate the main drivers of farmer-herder conflict in selected states.

In Nigeria, Agriculture is the most important sector to the economy after oil of which livestock production is a very crucial part though largely under-developed. Livestock has historically constituted one of the major economic resources in terms of the livelihoods of its populations but has remained the poor sector compared to mining and crop production in terms of its contribution to trade and export. This because of militating factors as stated below, the livestock production system has not translated transfer from the traditional sector to modern production methods, in the country:

- Lack or Inadequate Capital ;
- High Cost of Animal Feeds ;
- Livestock Diseases ;
- Lack of Access to Vaccines and Veterinary Services ;
- Lack of Storage Facilities ;
- Inadequate Manpower.
- Inadequate Basic Infrastructure ;
- Poor Transportation ;
- Poor Livestock Waste Management ;
- Poor quality of feed.

Project Development Objectives Indicators

The expected key Project Development Objectives of the proposed World Bank assisted Livestock Productivity and Resilience Support Project (L- PRES) outcome indicators are:

- Farmers adopting improved agricultural technologies (number);
- Increase in productivity of livestock species in targeted production systems (carcass weight in kilograms, liters of milk per cow per day);
- Incidence of resource-based farmer-herder conflicts (percent of administrative units reporting conflict);
- Share of target beneficiaries with rating “satisfied” or above on process and impact of project interventions (percent); and
- Direct project beneficiaries (sex-disaggregated number).

Project Components

The project is funding the following aspects:

- Component 1: Support to Institutional and Innovation System Strengthening;
- Component 2: Support to Livestock Value Chain Enhancement; and
- Component 3: Support to Crisis Prevention and Conflict Mitigation.

Project Beneficiaries

The selected value chains of the Livestock Productivity and Resilience Project (L-PRES) will be beef, dairy, poultry, sheep and goats, hides and skins, pigs, and honey. Direct beneficiaries will mainly be smallholder producers and will include:

- The estimated 2.4 million direct beneficiaries who will benefit from the national institutions that will be strengthened to provide national, improved service delivery as outlined under Component 1. This figure represents the overall direct beneficiaries who will benefit from either a component or a combination of two or even the 3 components;
- 70,000 direct beneficiaries who will benefit from participating in the strengthened livestock value chains that aim to facilitate productive alliances, as outlined in Component 2;
- 300,000 direct beneficiaries including vulnerable groups, particularly women and youth (between the ages of 18 and 35) groups, in the project areas as described in Component 3. Women and youth will be specifically targeted through the Productive Alliance (PA), with at least 30 percent of project funds earmarked to support women and youth-led enterprises. The project would also benefit professional organizations involved in livestock sub-sector;
- From a national scope, Nigeria's consumers will benefit from improved quality and more reliable supplies of more diversified livestock products. Increased supplies of livestock products will contribute to narrowing the dietary animal protein gap and thereby improve nutritional health, especially of children;
- Indirect beneficiaries will include livestock producers not directly involved in project activities, who will benefit from nationally enhanced programs such as improved animal disease service delivery;
- Buyers, processors, middlemen, meat and egg retailers, and exporters along the livestock value chains will benefit from the increased provision of livestock and livestock products;
- Additional indirect beneficiaries will be the livestock service providers, private veterinarians, input providers including commercial pastures producers feed, veterinary medicines, and genetic improvement material suppliers.

ES 02 Project Locations

The Federal Government of Nigeria intends to develop the livestock sector nationwide and to cover a wide scope of livestock products and value chains in selected states. While the livestock sector is wide and presents promising market opportunities, the Project will be selective and target value chains that will maximize the investments' economic returns and the impact on rural incomes and job creation.

Specific project location is yet to be determined. However, the Project locations would be selective with focus on regions where it can demonstrate high potential impact.

The States' selection criteria include value chains based on comparative advantages, subsector growth prospect in the States, formal expression of interest by States, existing value chains and markets, regional representation in the final selection, upfront commitment for payment of Counterpart Fund and States' performance in ongoing externally financed projects. Selectivity will also consider other donors' interventions in the livestock sub-sector.

ES 03. Need for Waste Management Plan (WMP)

Recognising the critical challenges and nexus livestock's waste can pose to the environment, climate change, public health and the food chain, as part of the implementation of Nigeria Livestock production and resilience support project activities, there is need to develop a Waste Management Plan (WMP) which is designed to minimise potential harmful effects on human, animal health and on the environment that may arise particularly in the context of waste storage, collection, transportation, treatment and disposal.

Scope of Work

To prepare a Waste Management Plan (WMP) on livestock farms, that include non-hazardous and hazardous (e.g. expired veterinary medicines, fallen stock etc.) waste.

ES 04. Regulatory Framework

In Nigeria, the power of regulation of all environmental matters is vested in the Federal Ministry of Environment (FMENV), hitherto, the now defunct Federal Environmental Protection Agency (FEPA) that was set up by Act, of 1988.

Mandate for environmental protection and management related to projects in various sectors of Nigerian economy are enforced under:

- Current Federal, State and Local and relevant acts, rules, regulations and standards, and the common law of the Federal Republic of Nigeria (FRN)
- International environmental agreements and treaties ratified by the Federal Republic of Nigeria
- World Bank Policies

World Bank's Environmental and Social Guidelines

The World Bank's environmental and social safeguard policies are a cornerstone of its support to sustainable poverty reduction. The objective of these policies is to prevent and mitigate undue harm to people and their environment in the development process. The effectiveness and development impact of projects and programs supported by the Bank has substantially increased as a result of attention to these policies have often provided a platform for the participation of stakeholders in project design and have been an important instrument for building ownership among local populations.

ES 05. Assessment of Potential Impacts

The increase in livestock production and processing activities will result in several impacts from waste within the environment in which they are located. These are:

Table ES 01: Summary of Potential Impacts Associated with Livestock waste

POTENTIAL ADVERSE IMPACTS	
SOCIAL IMPACTS	ENVIRONMENTAL IMPACTS
<ul style="list-style-type: none"> • Public discomfort and mood swings from odor; • Heightened risks of pathogens (disease- and non-disease-causing) passed from animals to humans; • Emergence of microbes resistant to antibiotics and antimicrobials, due in large part to widespread use of antimicrobials for nontherapeutic purposes; food-borne disease; worker health concerns; and dispersed impacts on the adjacent community at large; • Attraction of rodents, insects and other pests, release of animal pathogens, groundwater ; • Risk of occupational accidents, injuries and diseases. 	<ul style="list-style-type: none"> • Deterioration of ambient air quality due to the release of odor, fugitive dusts and gaseous pollutants; • Noise & vibration disturbances from operation of waste treatment equipment (for large scale operations); • Destruction of natural habitat & displacement of fauna particularly in wetland areas. • Soil contamination from manure; • Groundwater contamination from waste water and manure leaching; • Surface water contamination as a result of sediment/pollutants run off from exposed soils and accidental leakage/runoff of manure lagoon into water; • Greenhouse gas emissions that affect climate change.

ES 06 Waste Management Plan

The WMP is expected to guide the project implementation unit and other stakeholders in the proper implementation that will achieve project environmental sustainability objective. This WMP has been designed to cover all activities that may be associated with the LPRES works, throughout the entire life cycle of the project at production and processing phases of the ruminants and the poultry animals.

ES 07. WMP Implementation

The successful implementation of the WMP will depend on the commitment of the Project Management Unit and other supporting institutions relevant to delivering essential waste management and integrated environmental & social functions.

Capacity Development & Training

Training and capacity development needs for the proper and effective implementation of this WMP that will involve the safeguards team and the contractors in areas of waste management implementation plans, HSE safety and compliance etc. is put at **Six Hundred and twenty thousand Naira Only (₦620,000.00)**.

Monitoring Plan

Cost of monitoring compliance on this project by monitoring the environmental aspects such as Air Quality, noise, soil and occupational health & safety (HSE compliance) and waste management, is put at **Nine hundred thousand naira only (₦900,000)**.

Implementing the WMP

The cost of implementing this WMP is a total of all the individual costs as provided in table ES 03.

Table ES 03 Costs of implementing the WMP

Heading	Indicative Costing in Naira (₦)	Cost estimate in USD
Sites Specific WMP Mitigation Measures	25,030,000.00	\$60,900.24
Training	620,000.00	1,508.52
Monitoring Programme	900,000.00	2,189.78
Sub Total	26,550,000.00	64,598.54
Contingency	2,655,000.00	6,459.85
Total	55,755,000.00	135,656.93

(1USD =411.00)

Additional Technical and Infrastructural Support

Infrastructural capacity support for waste technologies over a period of 5- 40 years is at One hundred and Eighty-Seven Million, one hundred and thirty thousand naira only **(₦187,130,000) on a need basis.**

CHAPTER ONE: PROJECT BACKGROUND

The Government of Nigeria has requested the assistance of the World Bank for the preparation of Livestock Productivity and Resilience Support. The Project Development Objectives (PDO) is to improve the productivity of the livestock value chain and mitigate the main drivers of farmer-herder conflict in selected states.

Livestock production involves rearing domesticated animals ranging from cattle, goats and sheep, pigs and poultry birds (chicken, turkey, guinea fowl, ducks and geese) for food and commercial purposes for meats, eggs, milk, leather production etc. It is also a system where domestic animal breeding and living conditions are controlled by humans. Animal products are responsible for one-sixth of the human food energy and more than one-third of the protein requirement on a global basis which denote the importance of livestock farming. Livestock production is very essential to food security and the development of any nation as a source of foreign exchange for the economy, prestige, employment, as a rich source of protein which is essential for human nutrition, providing income for the citizens, provides raw materials for the industries (shoe and clothing) and by-products useful in various other industries such as the cosmetic industry. In Africa, Livestock has historically constituted one of the major economic resources in terms of the livelihoods of its populations but has remained a poor sector compared to mining and crop production in terms of its contribution to trade and export. This is because livestock has not translated from the traditional sector to modern production methods, especially in West Africa.

In Nigeria, Agriculture is the most important sector to the economy after oil of which livestock production is a very crucial part though largely under-developed. According to the National Animal Production Research Institute (NAPRI), it accounts for one third of Nigeria's agricultural GDP, providing Income, employment, food, manure and transportation. It is also one of the major sources of revenue through taxation and export of hides and skins. Livestock, especially ruminants, are the most efficient users of uncultivated land and contribute substantially to crop production.

Livestock population in Nigeria is not evenly distributed with cattle, mostly reared in the Northern states while sheep, goats and poultry birds are widely reared all through the country.

1.1 Factors that Increase Livestock Productivity

The following factors are responsible for increase in livestock productivity:

- Adequate supply of nutritious feed
- Proper sanitation and hygienic environment
- Good health care.

1.2 Economic Importance of Livestock Production

While agriculture is an important economic activity in most countries, it is known to dominate the economies of developing countries in terms of its contribution to the Gross Domestic Product (GDP) and it supports livelihoods. Livestock production constitutes a major economic resource in terms of livelihood and population of a country. At the global level, it is estimated that 70 percent of the rural poor's livelihoods is supported by the animal sector, representing approximately 20 percent of animal products traded worldwide (Ali, 2007). Livestock production serves as an additional security by being an asset. Economic importance of livestock production includes the following;

- **Source of Food:** Livestock farmers provide food for their families and indirectly for the families of their employees apart from the fact that there are lots of food generated from livestock such as milk and meat from cattle, eggs and meat from poultry, healthy meat from snail farming and fish. It contributes one-third of the protein that people consume: poor people depend on animal-source food (especially dairy products) to ensure that their diets deliver the nutrients necessary for cognitive and physical development. It addresses malnutrition by supplying the essential nutrients that are lacking in plant-source foods. Among these are micronutrients such as iron, zinc, vitamin B-12, riboflavin and conjugated linoleic acids. In addition, supplementing the diet of pregnant women and children with foods of animal origin has resulted in improved maternal, foetal and child health outcomes such as successful births, reduced maternal mortality, increased prenatal growth rates and improved cognitive functions.
- **Employment generation:** Livestock production is one of the oldest forms of employment and still creating employment for some university graduates and secondary school leavers. It has become a source of livelihood for some communities and families through selling of the animals and animal products (milk, eggs, skin and meat).

- **Income to farmers and income generation through taxes:** The government generates income through taxes paid by livestock farmers, also through export of hides and skins. Livestock farmers generate income and subsistence through their sale or consumption while with manure, livestock provides an input to crop agriculture thereby increasing production and income. A farmer's stock of animals constitutes his financial base thereby disposing the animals for income generation whenever it is necessary.
- **Increases savings and investment:** Farmers are able to invest their money into other forms of businesses and, they are able to derive some savings from their income too.
- **As a tool for social status:** Cattle, sheep and goats remained relevant as measuring tools of social status and economic strength among the rural households in the northern region of the country. The size of cattle herds and flock of sheep owned by an individual or household determines the economic strength
- **Foreign exchange earnings:** Some of the livestock products are been exported outside the country which leads to foreign exchange earnings for the country and increases the income of the livestock farmers. According to Stanford 2010, livestock production accounts for approximately 40 percent of the global agricultural gross domestic product.
- **Raw materials for industry:** All parts of livestock farming serve as raw materials for industry from milk, beef, poultry, snail shell, pig meat and fish.
- **Transportation:** Cattle also serve as good means of transportation and animal traction among the livestock farmers in the northern region of the country, whereby the animals are used for land cultivation in preparation for crop cultivation, transportation of farm families to and from the farms and transportation of farm produce between farms and storage points.

1.3 Factors Affecting Livestock Production

In Nigeria animal production is facing numerous challenges with certain factors affecting the success of animal production. The following are factors affecting livestock production in Nigeria:

- **Lack or Inadequate Capital:** Capital is one of the most crucial needs to set up a livestock production farm. It is the major factor militating against the success of a livestock farm in most developing countries including Nigeria. The livestock industry which is dominated by low income earners are not able to cope with the financial

demands to function efficiently for maximum productivity in the industry. Most farmers involved in livestock farming device other means of earning income to meet their needs.

- **High Cost of Animal Feeds:** feeds with maximum proportion of nutrients essential for growth and productivity of animals are expensive and not readily available to farmers. Since farmers go into livestock production to make profit and have enough to take care of their needs, purchasing feed at high price will not make them break-even: but also deprive them of reasonable profit.
- **Livestock Diseases:** Diseases remain an almost inevitable constraint to livestock productivity. It imposes direct costs on the livestock sector, as a result of animal deaths, reduced productivity and the cost of disease control. Viral infections such as Newcastle disease and Infectious bursal disease (Gumboro) remain one of the leading causes of death in poultry birds despite several attempts at vaccinations. Some of the reasons for these may be vaccine failure and the involvement of quacks in fighting these endemic animal diseases in the country.
- **Lack of Access to Vaccines and Veterinary Services:** local livestock farmers have little or no access to vaccines and veterinary services. This is because most of these farmers reside in rural and remote areas and even when accessible, the cost of vaccines and charges for veterinary services is high. In the absence of funds to involve professional veterinary doctors they fall victim to quacks who administer fake drugs and wrong prescriptions for treating diseases thereby wrecking the farmers of viable livestock.
- **Lack of Storage Facilities:** Most livestock products such as meat, eggs, milk are perishable and often farmers lose instead of making profit due to lack of storage facilities.
- **Inadequate Manpower:** There is a short supply of, especially, skilled labour in the animal production industry in Nigeria for example in some quarters one man does the work of many people leading to inefficiency in productivity. More people should be encouraged to go into livestock production in order to boost manpower involved in animal production.
- **Inadequate Basic Infrastructure:** lack of proper mechanized animal farming using modern infrastructure such as improved milking machines that could reduce the incidence of diseases like mastitis and good animal houses to help productivity of the animals by focusing on intensive farming instead of allowing small ruminants for

example, to roam about scavenging for food and the large ruminants invading crop farms in the community and destroying harvests meant for human consumption-an issue which has often been a source of communal conflicts.

- **Poor Transportation:** Transportation is a vital aspect of the livestock production industry. Lack of access roads to and from farms to the market hampers the development of the animal production industry. Most methods used in Nigeria for transporting ruminants from the north to the south of the country go against standard animal welfare procedures for the safety as animals are overcrowded in trailers for mass transport making them sustained traumatic injuries and stress that affects their health and productivity.
- **Poor Livestock Waste Management:** Livestock industries produce meat, milk and egg, and generate large volumes of waste water and solid wastes that could be beneficial or harmful to the environment. The waste products which includes livestock or poultry excreta and associated feed losses, beddings, wash -water and other such waste materials represent a valuable resource that if used wisely, can replace significant amounts of inorganic fertilizers but may be a direct threat to human and animal health (Taiganides, 2002).
 - Animal wastes in the form of manures are valuable sources of nutrients and organic matter for use in the maintenance of soil fertility and crop production. Studies with animals have shown that 55–90% of the nitrogen and phosphorus content of animal feed is excreted in faeces and urine (Tamminga et al., 2000) normally used as manure.
 - However, careless dumping of livestock waste on farm lands and direct discharge to waterways and percolation to groundwater, usually in by-pass flow via cracks and fissures, is a great risk to human and animal health because livestock waste contains myriads of pathogens some of which may be zoonotic and can cause systemic or local infections
 - Livestock wastes are sources of malodorous originating from livestock buildings, storage and field application of animal manures. The intensity of malodorous is often unacceptable, especially for neighbours in surrounding residential areas.
 - Globally, the concentration of the greenhouse gas methane (CH₄) in the atmosphere has increased by 45% since 1850 (Lelieveld et al., 1998). Increases

in livestock production have contributed significantly to this increase and it has been estimated that enteric fermentation of ruminants contributes some 13–15% and livestock waste 5% to the total emission of CH₄ in the 1990s.

1.4 PDO – Level Results Indicators

The expected key Project Development Objectives of the proposed World Bank assisted Livestock Productivity and Resilience Support Project (L- PRES) results indicators are:

- i. Farmers adopting improved agricultural technologies (number);
- ii. Increase in productivity of livestock species in targeted production systems (carcass weight in kilograms, litres of milk per cow per day);
- iii. Incidence of resource-based farmer-herder conflicts (percent of administrative units reporting conflict);
- iv. Share of target beneficiaries with rating “satisfied” or above on process and impact of project interventions (percent); and
- v. Direct project beneficiaries (sex-disaggregated number).

1.5 Project Locations

The Federal Government of Nigeria intends to develop the livestock sector nationwide and to cover a wide scope of livestock products and value chains in selected states. While the livestock sector is wide and presents promising market opportunities, the Project will be selective and target value chains that will maximize the investments’ economic returns and the impact on rural incomes and job creation.

Specific project location is yet to be determined. However, the Project locations would be selective with focus on regions where it can demonstrate high potential of impact.

The objectives and scope (including institutional and capacity strengthening, animal health improvement, livestock transhumance, etc.), requires that the FGN consider LPRES to be a national program with potential to benefit all 36 states in Nigeria and contribute to achieving the NLTP objectives.

However, to incentivize efficient implementation and attainment of desired outcomes, the design adopts a selectivity and implementation readiness-based approach towards state participation. Under this approach, states that meet specific technical and implementation-readiness criteria are eligible to join the Project. Technical eligibility criteria include the states’

commitment to the program, their livestock production capacity, existing policy and institutional reforms in the sector, and prevailing conflict intensity related to pressures on natural resources. Implementation-readiness criteria include the presence of foundational institutions necessary for livestock development (including supportive livestock infrastructure), allocation of funds to the Project and the livestock sector more generally by the state, whether implementation already commenced with states' own resources, establishment of SCOs to lead project implementation, preparation of procurement plans, and completion of fiduciary assessments.

As at appraisal, 10 states¹, out of the 28 that expressed interest in joining the Project, had met the selectivity and implementation readiness criteria and are thus the initial set of project states. These are: **Bauchi, Benue, Edo, Taraba, Oyo, Akwa-Ibom, Anambra, Ondo, Niger, and Adamawa**. Other states would join the Project during implementation as and when they meet the Project set criteria, but no later than two years after project effectiveness. Under component 4, a pool of resources has been earmarked to support states in their efforts to meet the Project's selectivity and implementation-readiness criteria.

1.6 Project Components

The Project will have three inter-related technical components:

- Component 1: Support to Institutional and Innovation System Strengthening;
- Component 2: Support to Livestock Value Chain Enhancement; and
- Component 3: Support to Crisis Prevention and Conflict Mitigation.

1.7 Need for Waste Management Plan (WMP)

As part of the implementation of Nigeria Livestock production and resilience support project activities, there is need to develop a Waste Management Plan (WMP), which is designed to minimize potentially harmful effects on human, animal health and on the environment that may arise particularly in the context of waste storage, collection, transportation, treatment and disposal.

1.8 Scope of Work

¹ Indications are that more states would be admitted before the project kicks off. FMARD is currently working with 21 states for admittance into the project. The states are Bauchi, Gombe, Borno, Yobe, Adamawa, Taraba, Kano, Katsina, Zamfara, Kaduna, Kebbi, Benue, Niger, FCT, Plateau, Imo, Anambra, Ogun, Osun, Ondo, Edo

To prepare a Waste Management Plan (WMP) on livestock farms, that include non-hazardous and hazardous (e.g. expired veterinary medicines, fallen stock etc.) waste.

The Waste Management Plan (WMP) is to review and assess the existing legal, regulatory, and organizational framework for livestock and veterinary waste management within the study areas, including the framework at the local, state and federal government levels. The specific tasks are outlined in annex 1 of the report.

The report will be structured thus;

- Chapter 1: Project Background
- Chapter 2: Project Description
- Chapter 3: Policy, Institutional and Regulatory Framework
- Chapter 4: Stakeholder's Consultation and Engagement
- Chapter 5: Livestock Value Chain and Waste generated
- Chapter 6: Impact of Veterinary and Livestock Waste and mitigation measures
- Chapter 7: Livestock Waste Management Plan
- Chapter 8: WMP and Institutional Arrangement
- References
- Annexes

CHAPTER TWO: PROJECT DESCRIPTION

The overall approach of the project is to assist in the development and implementation of a Livestock Master Plan, which will govern the technical and institutional aspects of improving livestock productivity. Among others, the project will address low livestock productivity, provide support for improving the quantity and quality of feed supplies and feeding technologies through pasture development and the establishment of fodder-banks and substantially upgrade public sector animal health and livestock extension. The project will be structured as an Investment Project Financing (IPF) of US\$532.7 million. Of this amount, US\$500 million is expected to be IDA credit financing, while US\$32.7 million will be contribution from the GoN mainly towards crisis mitigation, livestock service centers and project management.

2.1.

Description of Project Components

Each of the components have sub-components. Details of these components are;

Component 1: Institutional and Innovation System Strengthening (US\$95 million IDA)

The objective of project support under this component is to strengthen the policy and institutional foundations necessary to underpin the improved performance and governance of the livestock sector in Nigeria. Project support will focus on (i) strengthening the livestock policy and regulatory framework, planning, and monitoring at both Federal and State levels; and (ii) improving the capacity and capability of relevant institutions in the sector's innovation system to deliver public goods and services necessary to improve sector productivity, increase resilience of sector-dependent livelihoods, reduce competition for natural resources and the sector's negative externalities. Project support will be provided through three related, and mutually re-enforcing subcomponents.

Subcomponent 1.1: Support to Policy Formulation, Planning and Capacity Strengthening (US\$15 million IDA) This subcomponent aims to strengthen the policy environment, knowledge base, and human resource capacity of the livestock sector as a springboard for enhancing livestock productivity, resilience, and value chain performance. It will finance five activities, beginning with preparation of a comprehensive Livestock Master Plan ² and follow-up analyses to guide the development of a sustainable, efficient livestock sector in the short to medium term. The Livestock Master Plan will address the spectrum of ruminant production systems (pastoral, mixed, intensive) and their trade-offs in terms of economic, social, environmental, and public health risks and opportunities, in the context of a changing climate. Second, Subcomponent 1.1 will finance feasibility studies of cost-efficient tools and systems (such as digital technologies) to improve the collection, analysis, and dissemination of data adapted to public and private stakeholders' needs, including data on herd population characteristics and dynamics, productivity trends, animal movements (linked to transhumance and trade), market prices, and other variables. Based on those studies, the third

² Livestock Master Plans are developed through a systematic process using global reference tools available in the Livestock Sector Investment and Policy Toolkit (LSIPT). See <https://www.fao.org/3/ca7635en/CA7635EN.pdf> and <https://www.ilri.org/livestock-master-plans>.

activity under this subcomponent is to develop and pilot promising prototypes of data tools and systems in selected states. The fourth activity is to develop sub-sector policies related to feeding, breeding, dairy and animal health and roll out a competitive scholarship program for postgraduate studies (targeting at least 50 percent women beneficiaries), as well as continuing education and capacity-building programs for key stakeholders at the federal and state levels to improve livestock policy and regulation formulation, enforcement, monitoring and evaluation (M&E), and technical knowledge related to the different production systems. Lastly, this subcomponent will provide financing to explicitly mainstream climate change adaptation and mitigation objectives across all relevant policies (including the Livestock Master Plan and NLTP) and regulations to strengthen the foundation for addressing climate change challenges in the sector.. .

Subcomponent 1.2: Support to Animal Husbandry and Advisory Support Services (US\$40 million)

Subcomponent 1.2 will build producers' resilience to climate change and reduce the sector's GHG emissions and other negative environmental externalities by improving the availability and adoption of superior livestock breeds, Good Animal Husbandry Practices (GAHPs), and feed resources adapted to the diversity of ruminant production systems. It will finance four sets of activities that contribute directly to climate change adaptation and mitigation by reducing methane emissions per unit of meat or milk produced (based on improved feeding and manure management) and by increasing carbon sequestration (based on improved pasture and rangeland management).

The first set of activities will support the development and implementation of a genetic resource management strategy, with large ruminants as a priority. Aside from traits preferred by producers (increased productivity, early maturity) and markets, breed improvement and selection will emphasize traits that confer resilience to climate-induced stresses, enabling livestock performance to improve as the climate changes. This strategy will be supported through corresponding investments in building (or rehabilitating) and equipping artificial insemination (AI) and breed multiplication centers, and in strengthening the technical capacity of AI extension agents to guide breed selection and improvement and increase access to services for farmers. Second, Subcomponent 1.2 will finance the development of user-friendly, comprehensive extension training materials (including digital guides) on GAHPs. These materials will cover the range of ruminant production systems and incorporate approaches for climate change adaptation and mitigation. Farmer Field Schools will also be supported to facilitate applied research and learning for groups of herders. Technical support for breed improvement and the introduction of GAHPs will give preference to female producers and be adapted to their needs, to overcome the challenges and risks that often limit women's experimentation with new technology.

The third set of activities under this subcomponent is the promotion of improved feed production techniques (the use of agricultural by-products, composition of balanced feed, feed storage technologies); improved feeding practices adapted to animal needs, with potential to reduce methane production; and improved grazing and rangeland management practices (individual or community based) that increase soil carbon stocks and reduce erosion. Fourth,

this subcomponent will finance training of state-level extension agents to use the new materials, guides, and approaches to improve service delivery. Extension agent training, extension protocols, and extension and advisory services for livestock producers will incorporate content and approaches to close gender gaps in livestock ownership and value-chain position, such as training in socio-emotional skills to support women's successful entrepreneurship, or adjustments in training content, delivery modalities, and timing to accommodate gender differences in digital literacy, digital access, and household responsibilities. This subcomponent will disburse through input-based financing.

Subcomponent 1.3: Support to Animal Health Services Strengthening (US\$40 million IDA)

Subcomponent 1.3 will strengthen the delivery of livestock health services and improve the coordination between animal, human, and wildlife health services, as embodied in the One-Health concept. Improvements in the delivery of animal health services will increase productivity by reducing livestock morbidity and mortality, in turn improving the resilience of livestock and livestock-based livelihoods³ to climate shocks, including diseases induced by climate change. By contributing to greater efficiency (increased milk yield, daily weight gain, reproductive performance, feed conversion ratio), improvements in animal health will also reduce the intensity of GHG emissions from the livestock sector and help to mitigate climate change. Expanding the capacity of animal health services and improving their coordination with human health services is also the key to preventing and responding to public health threats such as AMR and zoonotic diseases, including those with pandemic potential.

In this context, Subcomponent 1.3 will strengthen national animal health services, building on the recommendations of the 2019 OIE PVS report through several activities. First, it will improve the organization and procedures of the national Veterinary Services by establishing a sanitary mandate to delegate official tasks to private veterinary professionals for the prevention and control of regulated diseases of economic and public health importance. Second, it will finance infrastructure and equipment (including solar-powered cold chains, which contribute to climate change mitigation), inputs, training, communication/awareness, and operating costs of selected nationwide programs for disease surveillance, clinical and laboratory diagnostics, and disease control and eradication, with Peste des Petits Ruminants (PPR) as a priority.⁴ The third activity under this subcomponent is to improve quality control for veterinary medicines (including antimicrobial agents) and ensure their prudent use to reduce risks to public health. Fourth, Subcomponent 1.3 will finance the establishment of One-Health platforms at the subnational level to increase collaboration and encourage the development of joint programs with other sectors and disciplines (human health, environmental health). This activity will complement and be implemented in coordination with the WBG-financed Regional Disease System Support Enhancement (REDISSE) Project in Nigeria.⁵ The fifth activity focuses on

³ Over 25 percent of smallholder stock is lost to preventable and treatable diseases.

⁴ Nigeria participates in the global PPR eradication program, and under the Regional Sahel Pastoralism Support Project, Phase 2 (PRAPS-2) will receive support to develop national strategic plans for PPR eradication and Contagious Bovine Pleuropneumonia (CBPP) control, harmonized with plans developed by other PRAPS-2 countries.

⁵ This regional program supports a coordinated approach among countries in West and Central Africa to detect and respond to disease outbreaks and public health threats of regional and international importance (P154807: Guinea, Sierra Leone, Senegal; P159040: Guinea-Bissau, Liberia, Nigeria, Togo; P161163: Benin, Mali, Niger, Mauritania; P167817: Angola, the Central African Republic, Chad, the Republic of Congo, and the Democratic Republic of Congo).

working with the private sector to expand the national capacity to produce and commercialize vaccines and other biologicals.

The sub-component will disburse through inputs-based financing and results-based financing based on the achievement of one PBC – the establishment of sanitary mandate program.

Component 2: Livestock Value Chain Enhancement (IDA US\$275 million): Component 2 builds on herd-level improvements in productivity arising from investments under Component 1 (improved breeds, animal health, and GAHPs) to expand overall production of meat and milk and reduce imports of those commodities. To that end, it will enhance and modernize the value chain for livestock products, promote a stronger commercial/market orientation among small and medium producers, and encourage increased private investment in priority segments of the value chain, while mainstreaming climate change adaptation and mitigation measures. In addition to augmenting national production, these activities will build more resilient livelihoods, create jobs, promote rural economic growth, and improve food safety. An enhanced value chain will help to ensure the sustainability of project investments and foster intensification, which will reduce the environmental (and carbon) footprint of the livestock sector. Project support will be provided under four subcomponents. .

Subcomponent 2.1: Support to Markets and Market Linkage Development (US\$ 160 million IDA):

Subcomponent 2.1 will foster a market orientation among small and medium producers by ensuring: (i) market access/availability; (ii) that producers capture a fair share of product/commodity value; (iii) transparency in market prices; and (iv) the highest level of appropriate value addition at the farm level through primary processing (bulking, cooling, sorting, packing, and so on) to increase profits and reduce food loss and waste. The demand-supply balance for meat (beef) and milk in Nigeria, as well as consultations held during project preparation, indicate that prospective off-takers and markets for these commodities abound in the country, including small and medium agribusinesses working or seeking to work in partnership with organized livestock producers. In this context, Subcomponent 2.1 will support and strengthen collective action by small-scale producers to “create volume,” add value, reduce transaction costs, and increase their bargaining power in identified commodity markets. Concurrently it will raise producers’ awareness of modern, climate-smart production technologies to increase efficiency (for example, in using land and feed, reducing feed loss along the value chain, and managing manure and waste) while reducing emissions and mitigating the negative ecosystem effects of livestock production.

To achieve these objectives, this subcomponent will finance: (i) the organization of livestock producers/herders into viable groups (cooperatives, associations, organizations, and the like) or the strengthening of existing groups; (ii) training and advisory services; and (iii) common assets for value addition (milking equipment, cooling centers, transport, services, and so on) that also serve to increase resilience and mitigate climate change. To facilitate women’s progression within value chains where they already participate—such as dairy—or their entry into traditionally male-dominated livestock value chains, activities under this subcomponent will take care to avoid reinforcing gender segregation in the value chains. The project will

consider men's engagement programming designed to ease restrictive social norms and promote women's entry into higher-value livestock value chains.⁶ Support for value addition will be coordinated with related activities implemented under the WBG-financed Agro-Processing, Productivity Enhancement and Livelihood Improvement Support Project (P148616) to ensure synergies and avoid duplication. Women borrowers seeking to enter value chains for large ruminants will be connected with livestock extension services and receive soft-skills training to facilitate success.

This subcomponent will also finance complementary activities to support market linkages and development, including an online market information system capable of reaching widely dispersed producer populations with information on buyer preferences, commodity prices, livestock supply and demand at the national and regional level, and other market variables. In tandem, it will support climate-smart upgrading/establishment of livestock markets with perimeter fencing, simple administrative buildings, water sources, weighbridges (to sell animals by actual weight rather than the more common visual estimates of size and weight), paddocks, loading ramps, and veterinary clinics, all with the aim of improving animal welfare and marketing efficiency. The establishment of markets closer to production areas is a mechanism to prevent conflict, as herders will not have to move stock over such long distances. Livestock markets will be equipped with biogas and/or manure composting facilities as a climate mitigation measure to reduce GHG emissions. Data recording systems at livestock markets will contribute to emerging traceability activities of the Federal Ministry of Agriculture and Rural Development (FMARD).

Most public abattoirs operating in Nigeria lack cooling facilities, sufficient water, and proper waste/effluent management systems, in violation of public health regulations. Working with local governments, Subcomponent 2.1 will provide support to rehabilitate/upgrade a network of strategically located abattoirs that will be operated under improved food safety, environmental, and public health regulations. Based on assessments to be conducted during implementation, new models for operationalizing these abattoirs—for example, concessions,⁷ public-private partnerships (PPPs), or fully private operators—will be explored and adapted to specific contexts. Special care will be taken to ensure that abattoir rehabilitation/upgrading is climate smart. The project will provide capacity building on slaughter processes, including aspects of health and hygiene, sanitary and phytosanitary regulations, and adherence to food safety standards. State Veterinary Departments will ensure compliance with animal and public health regulations through regular pre- and post-mortem inspections. The abattoirs will also be used for traceability and disease surveillance to promote improved animal and human health.

Finally, Subcomponent 2.1 will support the provision of business development services to enable value chain actors (producers, producer organizations, small aggregators, and others) to develop their entrepreneurial capacity, develop business plans that build climate resilience into their operations, and improve their access to finance and markets. This sub-component will disburse through input-based financing.

⁶ A recent impact evaluation documented the potential of light touch interventions: a couples training and planning intervention targeting the rubber value chain yielded significant agricultural productivity increases.

⁷ Following the example of the NGN 66 billion publicly financed silo complexes, grain aggregation centers, and Blumberg warehouses, which have been privatized through concessionary arrangements.

Subcomponent 2.2: Support to Increased Access to Finance (US\$ 70.00 million IDA):

This subcomponent builds on activities under Component 1 and Subcomponent 2.1 to further de-risk the livestock value chain, expand commercial lending in the livestock sector, and promote climate adaptation and mitigation. It will address critical challenges in providing credit to livestock value chains, particularly loan duration and realistic risk-adjusted pricing. Accordingly, Subcomponent 2.2 will finance three main activities: a credit line, risk-sharing facility, and technical assistance – all implemented through input-based financing. Support under this subcomponent will focus on three main activities: a credit line (US\$50.0 million), risk sharing facility (US\$15 million IDA), and technical assistance (US\$5.0 million).

Subcomponent 2.3: Support to Selected Livestock Service Centers (LSCs) (US\$45million IDA):

Activities under this subcomponent will complement activities under Subcomponents 2.1 and 2.2 by accelerating the momentum of smallholder commercialization and private sector investment in the livestock value chain, while scaling up climate-smart livestock production systems. In line with the NLTP, this subcomponent will provide support to create Livestock Service Centers (LSCs) in selected areas to promote commercialization, reduce open grazing, and attract private investment in the livestock sector. Conceived as pilots and modelled along the lines of agri-parks, the LSCs will be a community of businesses with a common interest in livestock and livestock products, situated in gazetted grazing reserves or other such land with unencumbered titles provided by the relevant states. The LSCs will complement the technical activities of federal and state entities and promote better integration of their services at the local level, supporting the broader territorial development needs of local livestock communities.

In line with the findings of detailed engineering and financial feasibility studies⁸ conducted during implementation, as well as the outcomes of demand-driven planning processes involving local communities, potential private sector investors, and other stakeholders, Subcomponent 2.3 will finance: (i) the detailed design and supervision of works, including verification that they are climate-smart; (ii) the development of the sites and construction of the essential infrastructure, based on the masterplan of the LSCs; (iii) the provision of selected climate-smart goods and services to catalyze intensification and increase the livestock product production, handling, processing, and marketing (knowledge and training centers, veterinary facilities, livestock breeding services, livestock markets, market information systems, milk collection and cooling facilities, water points, input outlets, rotational grazing areas, and others); and (iv) tailor-made technical assistance to bring the LSCs to full operational capacity. The design and construction of the LSCs will incorporate Eco-Industrial Park Guidelines⁹ and focus on mitigating climate change through resource-efficient technologies (for example, photovoltaic energy) and buildings that reduce GHG emissions. The gender gap in access to services will be reduced by ensuring that LSC facilities are designed to accommodate women's requirements (for example, with street lighting throughout the planned infrastructure, and separate women's and men's restrooms). The LSCs will also prioritize accessibility to women

⁸ These studies will include: (i) market assessment; (ii) preliminary design, including programming of climate-proof and energy-efficient construction; (iii) the study of options for optimal financing and management models—PPPs, build-operate-transfer (BOT) arrangements, or other concessionary agreements; and (iv) related Environmental and Social Impact Assessments (ESIAs).

⁹ See Kechichian, E., and M.H. Jeong (2016), Mainstreaming *Eco-Industrial Parks*. World Bank, Washington, DC. <https://openknowledge.worldbank.org/handle/10986/24921>.

by establishing service hours, such as weekend hours, that recognize women's disproportional household responsibilities.

The LSCs will be accessible to both sedentary and transhumant livestock keepers (with a focus on smallholders). Beyond promoting commercialization and private investment, these centers are expected to mitigate conflict through multi-stakeholder inclusive participation, discussions, and planning. The project will pilot LSCs in seven states in areas where livestock are concentrated, with scope to expand the model if it proves successful. The pilot states are key corridors for livestock movement within Nigeria and the region.

The establishment of LSCs will be through both input-based financing and results-based financing upon achievement of PBCs. In particular, the establishment of 2 LSCs in Kano and Bauchi states will be based on PBCs while the rest (5 LSCs) will be implemented through input-based financing. Kano and Bauchi LSCs were selected for results-based financing because implementation readiness of these LSCs is more advanced than the rest. The project will initially focus on these 2 LSCs that are PBCs based to ensure that proper attention is paid to the core aspects of establishing LSCs, including feasibility studies and design, management structure, and installation of infrastructure and facilities to crowd-in private sector agribusinesses. The experiences and lessons learned will be transferred to the implementation of the 5 LSCs that will be delivered through inputs-based financing..

Component 3: Crisis Prevention and Conflict Mitigation (US\$100 million: US\$100 million)

While improved provision of animal husbandry, animal health, and animal identification and traceability services under Component 1 will indirectly help to mitigate herder-farmer conflict (mainly through improved productivity, reduced resource-use intensity, and livestock security) thereby contributing to improved resilience of communities affected by conflict, Component 3 will address the most proximate causes of herder-farmer conflict: the declining quantity and quality of resources (water and rangeland), constrained access to resources, and declining social cohesion. In line with the NLTP, support will be channeled through two subcomponents, presented below..

Subcomponent 3.1: Support to Natural Resource Management and Pasture Improvement (US\$60 million IDA):

Subcomponent 3.1 will finance investments to improve the quantity and quality of water and rangeland—resources that are critical for productive pastoral systems with increased climate resilience and carbon sequestration. It provides support to assess the current status of water and feed (including forage and fodder) using remote sensing technologies and tools such as the FAO feed balance methodology. The resulting information will be disseminated to guide decisions on improved feed and water management, utilization, and access. Subcomponent 3.1 will also finance the establishment and implementation of an inclusive, community-driven process for climate-smart, sustainable rangeland/landscape management. All key users of grazing reserves and water will be involved in this process, which will establish clear conditions for accessing these natural resources and develop sound governance mechanisms to manage them. Support will also be available for constructing and rehabilitating stock routes and water points, with the goal of improving this network and including areas that offer new

rangeland/pasture. Committees will be established and supported to manage these investments sustainably. Subcomponent 3.1 will also finance the development of cultivated pasture, including facilities for irrigation in water-scarce environments.

Investments under this subcomponent will rely on community-driven development approaches. These investments will be coordinated with related/complementary activities under the proposed WBG-financed Agro-Climatic Resilience in Semi-Arid Landscapes Project (ACRESAL-P175237) where implementation areas overlap, particularly in rangeland improvement (as part of broader watershed management) and the provision of fodder from restored landscapes. All activities will be implemented through inputs-based financing. Besides increasing the amount and quality of grazing resources, which is a climate change adaptation measure, support for improved rangeland/pasture management will contribute to climate change mitigation through increased carbon sequestration above and below ground, as well as through reduced methane emissions from enteric fermentation, largely owing to improved pasture quality..

Subcomponent 3.2: Support to Conflict Mitigation (US\$40 million IDA)

This subcomponent provides support to increase capacity for conflict prevention and resolution, focusing initially on herder-farmer conflicts. Through activities at the local, national, and transnational level, this subcomponent seeks to: (i) mitigate the resource-based drivers of conflict; (ii) increase local capacity for conflict resolution; and (iii) facilitate policy dialogue to address the underlying drivers of conflict.

Local level. Subcomponent 3.2 will finance the establishment and support of local committees for conflict resolution and prevention and facilitate investments to alleviate pressure points. Local committees will build on existing formal and informal institutions and mechanisms of conflict resolution and receive training in conflict dialogue and resolution. Facilitators will support committees in mapping stakeholders, identifying sources of conflict, and drawing on local ideas and knowledge to address them. In partnership with community committees, the LPRES Project will support community dialogue and activities to promote social cohesion between herders and farmers, anticipate and resolve potential conflicts, and strengthen peacebuilding. Herders and farmers will jointly identify potential pressure points to help prioritize investments and data needs. Small-scale investments prioritized through this dialogue will be financed under this subcomponent in consultation with communities, local authorities, and representatives of both farmer and pastoral communities. Examples of investments include the construction and rehabilitation of critical infrastructure to secure mobility and access to pastoral areas/grazing reserves along transhumance corridors and stock routes (for instance, the marking of corridors, development of rest areas, provision of shelters and feed storage facilities) and mechanisms to enforce regulations, which are all essential to support productive and resilient pastoral systems.

National level. The project will support the creation of early warning systems using remote sensing and spatial analysis to forecast forage conditions and water availability, enabling pastoralists and the government to take preemptive action to prevent conflicts. This information will be disseminated through local committees to allow timely community responses. Under

this subcomponent, the project will also support dialogue on gazetted grazing reserves¹⁰ and transhumance corridors to strengthen their management and statutory protections against encroachment. Financing will be provided to prepare feasibility studies on livestock insurance mechanisms to indemnify producers against livestock losses (through theft, for example), which are known to trigger conflict.

Transnational level. The project will finance the organization of a high-level dialogue on transboundary agreements on animal movement. The objective is to ensure a coherent spatial approach and agreement between Nigerian states and between Nigeria and neighboring countries, including high-level dialogue with ECOWAS to establish consistent and coherent rules on transhumance. All activities will be implemented through inputs-based financing.

Component 4: Project Coordination and Management (US\$30 million IDA):

This component aims to ensure that programmed project activities are implemented in a timely and appropriate manner, with adequate support to overall project management, M&E, and communication. It will finance the creation and operation of a National Coordination Office in FMARD with the following main objectives: (i) ensuring effective strategic and operational planning, implementation, and M&E of the project, beginning with a baseline assessment to measure the project's progress and impacts; (ii) ensuring that all project funds are used efficiently, and coordinating project interventions implemented by participating stakeholders and partners; (iii) evaluating the project's mid-term and final results, outcomes, and impacts on beneficiaries; (iv) supporting states to meet the eligibility criteria for joining the project; and (v) supporting and ensuring efficient knowledge management and effective communication to various public and private entities on project activities, outcomes, best practices, and lessons learned. Staff training will include sessions on national climate change policies. Financing under this component will also be used to create State Coordination Offices (SCOs) to lead project implementation at the state level. All activities will be implemented through inputs-based financing..

Component 5: Contingency Emergency Response Component (US\$0.00 million)

Given Nigeria's vulnerability to shocks, the proposed project includes a Contingency Emergency Response Component (CERC) with a zero-dollar allocation. The CERC provides a mechanism within the project to finance a response to a natural disaster, disease, or other eligible emergency, should one occur. This CERC is particularly critical in light of the unpredictable trajectory of the COVID-19 pandemic, the continuing threat of a desert locust invasion in West Africa, and the potential for drought or floods. If a crisis develops, FGN may request WBG to reallocate project funds to cover some of the costs of emergency response and recovery. All expenditures under this CERC will be in accordance with paragraphs 11, 12, and 13 of WBG OP10.00. Expenditures will be appraised and reviewed to determine if they are acceptable to the World Bank before disbursement is made. Disbursements will be made against an approved list of goods, works, and services required to support crisis mitigation, response, recovery, and reconstruction. .

Table 1: LPRES Project by Component, Subcomponent and Activity.

¹⁰ The Government of Nigeria has approximately 415 grazing reserves, but only one-third are used, and intrusion by local farmers is common.

Component	Subcomponent	Activities	Potential Infrastructure Items
1.0: Institutional and Innovation System Strengthening	1.1: Support to Policy Formulation, Planning and Capacity Strengthening	Preparation of Livestock Master Plan	None expected under this sub-component
		Strengthening policy and regulation formulation, harmonization, and enforcement in the sector	
		Establishment of a livestock data and market information system	
		Undertake preparatory activities for a national livestock census	
		Mainstreaming climate change adaptation and mitigation objectives across relevant policies	
		Undertaking studies to improve selected value chains' regulatory and incentive framework	
		Capacity strengthening of FMARD and relevant institutions	
		Strengthening of national livestock inputs and products quality control facilities	
	1.2: Support to Animal Husbandry and Advisory Support Services	Development of a genetic resource management strategy	None
		Establishment of artificial insemination and breed multiplication centers	Upgrade of existing facilities with Artificial Insemination and Breed Multiplication facilities
		Development of livestock extension protocol	None
		Training and capacity building of state-level extension agents	None
		Establishment of Farmer Field Schools	None
		Development of tools and mechanisms to facilitate digital extension services	None
	1.3: Support to Animal Health Services Strengthening	Improving the organization and procedures of national veterinary services	None
		Development of Disease surveillance, and control/eradication programs	None
		Control of veterinary medicinal products quality	None
		Implementation of disease surveillance, and control/eradication programs	None
		Establishment of One-Health platforms at sub-national level	None
		Creation of enabling environment for private veterinarians	None
	2.0: Livestock Value Chain Enhancement	2.1: Support to Markets and Market Linkage Development	Organization and capacity strengthening of producers for improved market access
Development of an online market information system			None
Upgrading of livestock markets			Perimeter fencing, Simple administrative buildings, Water sources, Weighbridges, Paddocks, Loading ramps, and Veterinary clinics

		Upgrading a network of strategic abattoirs	Buildings, Sanitary facilities, Water sources	
		Support to BDS	None	
	2.1: Support to Increased Access to Finance	Line of credit	Cannot be determined at the preparatory stage. However, the exclusion list of the DBN and PFIs will apply	
		Risk sharing facility		
		TA for commercial banks and other non-bank financial institutions and lenders		
	Support to Selected Livestock Service Centers	Conducting detailed LSC engineering and financial feasibility studies		
		Design and supervision of works on LSCs within gazetted reserves with unencumbered titles.	Knowledge and training centers, veterinary facilities, livestock markets, milk collection and cooling facilities, abattoirs, water points, input outlets, rotational grazing areas, and others)	
		Provision of selected catalytic goods and services	None	
	3.0: Crisis Prevention and Conflict Mitigation	3.1: Support to Natural Resource Management and Pasture Improvement	Assessment of state of natural resources (feed and water) in the country	None
			Implementation of local community-driven sustainable rangeland management	None
Construction and rehabilitation of water points			Water points	
Cultivated pasture development			None	
3.2: Support to Conflict Mitigation		Development of governance mechanisms for accessing grazing areas	None	
		Establishment of national and local level committees for conflict mitigation	None	
		Capacity building for livestock and farmer community leaders in conflict resolution	None	
		Organization of dialogue on trans-boundary agreements on animal movement	None	
		Construction and rehabilitation of critical infrastructure along stock routes	Stock routes, Water points, Irrigation facilities	
		Development of early warning systems for crisis prevention	None	
Feasibility studies on livestock insurance mechanisms	None			
4.0: Project Coordination and M&E	Communication		None	
5.0: Contingency Emergency		Unknown	Unknown	

Response Component			
---------------------------	--	--	--

Table 2: Estimated costs and financing, Nigeria Livestock Productivity and Resilience Support Project

Project component	Project costs (US\$ million)	IDA financing (US\$ million)	% IDA financing
1. Institutional and Innovation System Strengthening	95.00	95.00	19.00
2. Livestock Value Chain Enhancement	275.00	275.00	55.00
3. Crisis Prevention and Conflict Mitigation	100.00	100.00	20.00
4. Project Coordination and Management ¹¹	30.00	30.00	6.00
5. Contingency Emergency Response Component	0.00	0.00	0.00
Total cost	500.00	500.00	100.00

¹¹ Includes refinancing of a Project Preparation Advance of US\$2.75 million.

CHAPTER THREE: POLICY, INSTITUTIONAL AND REGULATORY FRAMEWORK

Livestock production in Nigeria remains subsistent with limited market-orientation and poor institutional support. Market driven production requires re-orientation of the actors (dominated by nomads, pastoralist, peri-urban producers), within the production systems and responsive institutional support services for extension, research, input supply, rural finance and marketing. To date, Governments have been the main supplier of major inputs. While limited credit facilities to support livestock, development has been provided by microfinance institutions, small-scale micro enterprises and NGOs.

3.1 Historical Survey of Government Objectives and Policies toward the Livestock Sub-Sector

This section describes a review of government objectives and policies for the Livestock Sub-Sector (LSS) in Nigeria over four periods spanning: the colonial period preceding independence in 1960, the immediate post-independence period up to the end of the Sahelian drought in 1974, the oil-boom period from 1975-85, and the period since 1986 marking the commencement of the structural adjustment programme.

The Colonial Era

The colonial government objectives were primarily implemented through a policy of investment in both physical infrastructure and basic research such as extensive internal rail and road network system, Livestock Improvement and Breeding Centres (LIBCs) cross-breeding experiments-primarily to achieve increased milk production - wing exotic bulls and artificial insemination and studies to evaluate the potentials of exotic and local pasture species. However, most of the schemes embarked upon during this period were oriented toward ranching and thus had little impact on smallholder or pastoral systems. Furthermore, attention appears to have been focused mainly on cattle, particularly dairy production, to the exclusion of other species.

Independence to 1974

The onset of independence saw both a continuation and a shift in livestock development policy in Nigeria. On the one hand, some of the programmes initiated during the colonial period such as the tsetse eradication and livestock breeding programmes were continued. On the other hand, driven by a desire to improve the rate of growth of the economy and to achieve a more equitable distribution of income, the new regional governments initiated several programmes in an attempt to improve smallholder and pastoral systems. Starting in 1965, grazing reserves were

introduced into the Northern Nigeria region to protect the traditional grazing lands from crop farming, to secure a year-round source of fodder for ruminants and to encourage the settlement of pastoral nomads. In the south-west, a smallholder steer fattening scheme was introduced in the early 1960s. Using semi-intensive management systems, participating farmers fattened trypan tolerant steers for supply to slaughterhouses in the adjoining urban areas. The scheme proved successful, and the experience led to the establishment of a Smallholder Fattening Scheme in 1979 as a component of the World Bank assisted First Livestock Development Project (Federal Ministry of Agriculture, 1981).

Apart from these regional programmes, trade and production investment policies were also emphasized during this period. Trade policy towards the LSS initially took the form of import duties.

1975-1985

Policies instituted in the immediate post-independence period were largely continued in the 1975-85 period. The basic economic objective remained income growth with some new concern for increased animal protein intake.

Institutional policies involving land and credit were introduced during this period. The 1978 Land Tenure Decree vested all rural land not under active exploitation in state governors. Although an official title to land (i.e. certificate of occupancy) can be obtained through this decree, the process is both time consuming and expensive and, thus, out of the reach of most pastoralists. Further, it has been argued that the decree with its recommended high levels for land compensation has militated against land acquisition for the establishment of new grazing reserves (Waters-Bayer and Taylor-Powell, 1986).

The Agricultural Credit Guarantee Scheme (ACGS) was also introduced in 1978. The scheme was established to guarantee loans granted by commercial and merchant banks for agricultural purposes. Lending to the LSS has featured prominently since the inception of the scheme.

Post - 1986

The Structural Adjustment Programme (SAP) initiated in September 1986 has brought about a variety of sectoral reforms in the Nigerian economy. As it affects the LSS, it involves a reduction in the role of the state in production activities with a corresponding emphasis on using the private sector as an instrument for production and input supply. It has led to the scrapping of the NLPC and its subsidiaries.

Starting in 2010 – 2011, the Government of Nigeria, after years of benign neglect, began to reform the agriculture sector. To refocus the sector, the Government implemented a new strategy (the Agricultural Transformation Agenda, ATA) built on the principle that agriculture

is a business and therefore policy should be about supporting it. The main priority of policy was to “restart the clock” and reintroduce the Nigerian economy to sustainable agriculture centred on a business-like attitude driven by the private sector. That strategy was in place from 2011 – 2015.

In summary, the history of livestock development in Nigeria reveals a longstanding effort to find a strategy to improve productivity and raise output. Policies that have been instituted to have been fraught with consistency challenges, driven by macro-economic concerns rather than by a desire for livestock development and have put the attainment of government objectives into question.

Therefore, the policy regime, tagged the Agriculture Promotion Policy (APP) Policy is expected to deliver four federal priorities (food security; import substitution; job creation; and economic diversification) in partnership with the states government.

In addressing some of the above constraints, the government will apply prudent, market-based policy measures to grow the sector, with a clear recognition that widespread poverty reduction through the transformation of the agriculture sector is integral to the country’s long run economic growth trajectory and prosperity. Accordingly, this policy statement is anchored on three main pillars in line with the constitutional provision for the role of Federal Government in agricultural development:

- Promotion of agricultural investment;
- Financing agricultural development programmes and
- Research for agricultural innovation and productivity.

3.2 Acts, Regulations and Laws Governing the Livestock Production Value Chain

3.2.1 Constitution of the Federal Republic of Nigeria (CFRN) of (1999)

The constitution provides the general thrust of the nation’s environmental policy, recognizes the importance of improving and protecting the environment and makes provision for this. Relevant sections are:

- Section 20 makes it an objective of the Nigerian State to improve and protect the air, land, water, forest and wildlife of Nigeria ;
- Section 12 establishes that international environmental treaties ratified by the National Assembly should be implemented as law in Nigeria ;

- Section 33 and 34 which guarantee fundamental human rights to life and human dignity respectively, have also being argued to be linked to the need for a healthy and safe environment to give these rights effect.

These include:

- The World Bank Safeguard Policies, International guidelines and conventions to which Nigeria is a signatory.
- Laws and regulations, standards, policies, codes and recommended practices relating to the Infrastructural development by the Nigerian Government and its agencies such as the Federal Ministry of Environment.
- National policy on Environment (1989) reviewed in 1999 and 2016.
- Federal Agricultural Policy 2016- 2020
- State Agricultural Policy: Agriculture is a concurrent matter: this means that the federal states within Nigeria are entitled to make laws concerning agricultural development (Schedule II, 1999 Constitution of the Federal Republic of Nigeria). Every federal state may have its own agricultural policy and accords priority to crops that have comparable advantages, but in most cases state agricultural policy mirrors, but does not contradict, the Federal Government Agricultural Policy. Kwara, Osun and Ogun states maintain liberal agricultural policies and several incentives to attract foreign investors.

3.2.2 Federal Legislation

- Relevant Federal Legislations with bearing on acquisition of land for the project or disposal of waste, importation / exportation of animal products or waste, seizure/ destruction/ disposal of diseased animals and control of pollution arising from livestock production in the value chain are listed below.
- Land Use Act Cap 202 LFN 1990
- Environmental Impact Assessment Act 1992
- Federal Environmental Protection Agency Decree No 58 (1988) (Repealed under NESREA ACT)
- National Environmental Standards and Regulations Enforcement Agency (Establishments) Act of 2007
- Food and Drugs Act (Cap 150) of 1990 as amended by Decree 21 of 1999 (formerly called Food and Drugs Decree 35 of 1974)
- The Animal Disease Control Decree 10 of 1988
- The Marketing of Breast Milk Substitutes Decree 41 of 1990
- Counterfeit and fake drugs and unwholesome processed foods (Miscellaneous provisions) Decree 25 of 1999
- NAFDAC Marketing of infant & young children food and other designated products (Registration, Sales, etc.) Regulations 2005
- Quarantine Act - CAP. Q2 L.F.N. 2004
- The National Agency for Food and Drug Administration and Control (NAFDAC) Decree 15 of 1993 (as amended by Decree 19 of 1999)
- Drugs and related products (Registration etc.) Decree 1993
- Non-nutritive sweeteners in drug products (Prohibition) Regulations 1996
- Pre-packaged food (Labelling Regulation) 1995
- Food grade table or cooking salt regulations 1996

- Pre-shipment inspection of exports Decree 1996
- Pre-shipment inspection of imports Decree 1996
- Consumer protection council Decree 66 of 1992
- Inland fisheries Decree 108 of 1992
- Federal Republic of Nigeria Official Gazette. National Crop Varieties, Livestock Breeds (Registration etc.) Act of Jan 1987
- FGN. Federal Republic of Nigeria Official Gazette, Slaughter Stock (Control and Taxation) Law of 1955.
- FGN. Federal Republic of Nigeria Official Gazette. Grazing Reserve Law of 1965.
- Hides and Skins Act of 6th October, 1942

3.2.3 State Legislations

- States Environmental Protection laws
- State Agricultural Laws and Regulations

3.2.4 Federal Regulatory Bodies

- Federal Ministry of Agriculture and Rural Development (FMARD) (1966)
- Federal Ministry of Sciences and Technology (FMS&T)
- Federal Ministry of Environment (1999 Presidential Directive)
- The National Environmental Standards and Regulations Enforcement Agency (NESREA) Act No 25 of 2007

3.2.5 Applicable International Conventions, Treaties and Agreements

Nigeria is signatory to some international agreements and Protocols concerning the environment and relevant to the Livestock Productivity and Resilience Support Project, notably at operational phase in the course of waste outputs:

- International Convention on Biodiversity (1992)
- Basel Convention on Transboundary Movement of Hazardous Waste and their Disposal.1992
- United Nations Framework Convention on Climate Change (1992)

The emission of greenhouse gases is subject to the UN Framework Convention on Climate Change. The agreement, now signed by more than 150 countries, became legally binding in March 1994, and many signatories have voluntarily agreed to stabilize their carbon dioxide emissions at 1990 levels by 2000. The agreement is targeted at the other trace gases with which livestock production can be associated, i.e. methane and nitrous oxide. However, to minimize climate change from greenhouse gases, much more specific international agreements are required and efforts must be made to respect them.

Other key relevant international conventions to which Nigeria is signatory include:

- The African Convention on the Conservation of Nature and Natural Resources, The African Convention, 1968;
- The Convention Concerning the Protection of the World Cultural and Natural Heritage, The World Heritage Convention, 1972;

- The Convention on International Trade in Endangered Species of Wild Fauna and Flora, CITES, 1973;
- The Convention on Conservation of Migratory Species of Wild Animals, Bonn, 1979.
- The Convention on the Prevention of Marine Pollution by Dumping of Waste, MARPOL, 1972.

Nigeria also has obligations to protect the environment through various commitments to the African Union (AU), the Economic Community of West African States (ECOWAS) and the Commonwealth. It is also committed through relations with the European Community under the Lome IV Convention.

World Bank Safeguard Policies

The World Bank has in place a number of operational and safeguards policies, which aim to prevent and mitigate undue harm to people and their environment in any development initiative involving the Bank.

The World Bank has 10 Environmental and Social Safeguard Policies to reduce or eliminate the adverse effects of development projects, and improve decision making. Of these the following are triggered by the livestock project and apply for the life of the project unless significant changes to project description lead to a restructuring and change in safeguards policies:

- OP/BP 4.01: Environmental Assessment
- OP 4.09: Pest Management
- OP/BP 4.12: Involuntary Resettlement
- OP/BP 4.11: Physical Cultural Resources

3.3 The Institutional Framework

3.3.1 The Federal Ministry of Agriculture and Rural Development (FMARD)

The Federal Ministry of Agriculture and Rural Development (FMARD) is a Ministry of the Nigerian government that regulates agricultural research, agriculture and natural resources, forestry and veterinary research all over Nigeria through its agencies and departments such as the Federal Department of Fisheries and Federal Department of Livestock.

National Agricultural Land Development Authority Act

An Act of 7th May 1992 established the National Agricultural Land Development Authority to provide, among other things, strategic public support for land development.

The Nigerian Institute of Animal Science **was** established by the National Assembly Act No. 26 of 2007 under the Federal Ministry of Agriculture and Rural Development as a regulatory agency for Animal Science practice with powers to regulate all matters pertaining to Animal husbandry in Nigeria.

3.3.2 Federal Ministry of Science and Technology (FMS&T) Parastatals

The National Centre for Genetic resources and Biotechnology

The National Centre for Genetic Resources and Biotechnology (NACGRAB) was established in 1987 by the Federal Ministry of Science and Technology (FMS&T) to conduct research, gather data and disseminate technological information on matters relating to genetic resources conservation, utilization and biotechnology applications. The Centre, backed by Decree 33 of 1987 regulates the seed, livestock and fisheries industries.

The National Biotechnology Development Agency (NABDA) (2001).

The Agency was established under the aegis of the Federal Ministry of Science and Technology to implement the policy that is aimed at promoting, coordinating, and setting research and development priority in biotechnology for Nigeria. Part of its specific mandates is to undertake research, development and innovation, promotion and deployment of appropriate biotechnologies for increased productivity and value chain development to enhance sustainable agriculture and food security.

3.3.3 Federal Ministry of Health Parastatal

National Agency for Food and Drug Administration and Control (NAFDAC),

NAFDAC has power under its enabling law to conduct appropriate tests and ensure compliance with designated and approved standard specifications, including the investigation and inspection of facilities and raw materials used in the production of food, drugs, cosmetics, medical devices, and chemicals. It also has power, among others, to prevent the dumping of substandard and unwholesome regulated products and unwholesome processed foods into Nigeria and determine the suitability or otherwise of medicine, drugs, food products, cosmetics, medical devices or chemicals for human and animal use.

The quality and safety of food, drugs and other regulated products consumed by Nigerian consumers (whether locally or internationally produced and whether they emanated from conventional or biotechnological processes) and protection from health risks are publicly regulated and achieved through:

- Standard setting ;
- Information control ;

- The imposition of criminal liability on any person who produces any food or drug that is found to be "fake," "adulterated," "counterfeit," "expired," "substandard," and "unhealthy and unwholesome" ;
- This is further complemented by another provision extending liability to those selling or offering to sell, display, aid or abet any person to sell, produce, import, manufacture, sell or distribute food or drug, medical devices, cosmetics and chemicals which are injurious to health or adjudged to be fake, adulterated, banned or fake, substandard or expired.

Nigeria adopts the food safety standards set out in the Codex Alimentarius of the FAO in the banning of importation of foods. Consistent with this standard, Nigeria continues to ban imports of all:

- Bovine animal meat and edible offal (fresh, chilled, frozen).
- Pork, sheep, goats and edible offal of horses, asses and mules.
- Bovine spongiform encephalopathy (BSE) is the stated rationale, however, these bans apply to all countries, even those without BSE cases.

Nigeria also bans the import of live and dead poultry (with the exception of day-old chicks) and poultry meat, including fresh, frozen, and cooked poultry meat. While the stated rationale is to prevent the spread of avian influenza (AI), these bans were implemented during the 2006 AI outbreak and do not reflect current AI risk.

Foods, food additives or drugs must meet the NAFDAC safety and quality requirements under the NAFDAC Act before they may be sold or marketed in Nigeria. Although the NAFDAC Act does not distinguish between conventional and genetically modified products or processes, the Agency has several rules that would subject "more than minimally manipulated" human tissues and cellular products to the full panoply of rules governing drugs, devices or biologics.

3.3.4 Federal Ministry of Commerce Parastatals

- Standards Organization of Nigeria (SON),
- Nigeria Agricultural Plant Quarantine Services (NAQS) and Consumer Protection Council.

3.3.5 Federal Ministry of Environment (1999 Presidential Directive) and Parastatals

The Federal Environmental Protection agency (FEPA) was established by Decree No. 58 of 1988 and subsequently amended by Decree 59 of 1992 with further amendment by Decree 14

of 1999. FEPA was absorbed into the Federal Ministry of Environment (FMEnv) in 1999 by a presidential directive and its functions among others are now the responsibility of the new Ministry. The FEPA act has now been repealed in the NESREA act No 25 of 2007

National Biosafety Management Agency Act, 2015

This Act establishes the National Biosafety Management Agency charged with the responsibility for providing regulatory framework, institutional and administrative mechanism for safety measures in the application of modern bio-technology in Nigeria with the view to preventing any adverse effect on human health, animals, plants and environment.

The National Environmental Standards and Regulations Enforcement Agency (NESREA) Act No 25 of 2007

The Act establishing the Agency creates provisions for the setting of air quality standards and atmospheric protection. The Act also prohibits the discharge of hazardous substances into the air or upon the land and waters of Nigeria or at the adjoining shorelines except where such discharge is permitted or authorised under any law in force in Nigeria. Importantly, these provisions constitute a framework for controlling hazardous emissions and various forms of waste from to prevent environmental and health hazards and to enforce waste generator liability through extended producer responsibility due diligence.

Some of these regulations include among others:

- The National Environmental (Sanitation and Wastes Control) Regulation S.I 28 of 2009;
- National Environmental (Noise Standard and Control Emission) Regulations, S.I No. 35 of 2009;
- National Environmental (Hazardous Chemicals & Pesticides) Regulations 2014
- Federal Republic of Nigeria Official Gazette. National Environmental Protection (Effluent Limitation) Regulation of Jan 1991
- National Environmental (Textile, Wearing Apparel, Leather and Footwear Industry) Regulations, S. I. No. 34 of 2009;
- National Environmental (Food, Beverages and Tobacco Sector) Regulations, S. I. No. 33 of 2009;
- National Environmental (Wetlands, River Banks and Lake Shores) Regulations, S. I. No. 26 of 2009;

- National Environmental (Watershed, Mountainous, Hilly and Catchments Areas) Regulations, S. I. No. 27 of 2009
- National Environmental (Permitting and Licensing System) Regulations, S. I. No. 29 of 2009;
- National Environmental (Access to Generic Resources and Benefit Sharing) Regulations, S. I. No. 30 of 2009;
- National Environmental (Surface and Groundwater Quality Control) Regulations, S. I. No. 22 of 2011;

CHAPTER FOUR: STAKEHOLDERS' CONSULTATION AND ENGAGEMENT

Stakeholder consultations were carried out in selected states and with relevant institutional stakeholders in the states. Stakeholder Engagement activities to facilitate the development and sustainable implementation of the Waste Management Plan through the various stages of the Project's life cycle from construction through to, operations, closure and rehabilitation was were carried out during preparation of this document..

4.1 Objectives of the Stakeholder Engagement Plan (SEP)

Stakeholder Engagement involves a set of technically and culturally appropriate approaches to consultation and disclosure. The goal is to improve and facilitate decision making and create an atmosphere of understanding that actively involves project affected people and other stakeholders in a timely manner, and that these groups were provided sufficient opportunity to voice their opinions and concerns that may influence Project decisions. SE is a useful tool for managing communications between the NPCO/SCU and its stakeholders. The groups consulted are stated in table 4.1. below with the consultation method employed

The Key Objectives of SE process which was implemented can be summarized as follows:

- Understand the stakeholder engagement requirements under the National Environmental legislation;
- Provide guidance for stakeholder engagement such that it meets the standards of International Best Practice;
- Identify key stakeholders that relevant, and/or able to influence the Project and its activities;
- Identify the most effective methods and structures through which to disseminate project information, and to ensure regular, accessible, transparent and appropriate consultation;
- Guide PIU to build mutually respectful, beneficial and lasting relationships with stakeholders;
- Develops a stakeholder's engagement process that provides stakeholders with an opportunity to influence project planning and design;

Table 4. 1: Stakeholder Group Consultation Methods

STAKEHOLDER GROUP	CONSULTATION METHODS
Government Officials	<ul style="list-style-type: none">• Phone / email / text messaging• One-on-one interviews• Formal meetings
Livestock Farm Employees and Managers	<ul style="list-style-type: none">• Focus group meetings• Surveys
Non-Governmental Organizations	<ul style="list-style-type: none">• Phone / fax / email / text messaging• One-on-one interviews• Focus group meetings

4.2 Initial Consultation with stakeholders in Selected States

Stakeholder consultation is an important exercise that is necessary in achieving the success of any project. Initial consultations were conducted in selected states as indicated in Table 4.2 below. Annex 5 has Plate 4.1- 4.5 which are photo speak of the consultations at the visited states.

Table 4. 2: List of Value Chain Stakeholders in Selected States

No	State	Value Chain of Interest	Stakeholders to visit
1	Plateau (NC)	NAPRI (VOM VET School) Sheep and Goat	1. NVRI (VOM VET School) 2. State Ministry of Agric/ Department of Animal Husbandry 3. Ministry of Lands/ Dept of Land Management
2	Ogun (SW)	Pig Poultry Sheep and Goat	1. State Ministry of Agric/ Department of Animal Husbandry 2. Animal Care Farm, Ogere-Remo, Ogun Ministry State 3. Pig Farm Clusters/ Pig Farmers Association, Gberigbe Ikorodu Lagos.
3	Lagos	NGO on waste management	4. Waste Management Society of Nigeria (WAMASON)

Table 4. 3: Stakeholders Concerns, Organisational Issues and Concern

State	Type of Stakeholder	Stakeholders Assessment Criteria	Stakeholders Remarks and concerns
<i>Project identification, formulation and Design</i>			
Ogun State & Plateau State	Government Agency And Animal Care	Relevance of identified Project	The project is very relevant to the economy of the states and Nigeria in general.
		Livestock of interest to the Ogun State and Plateau State respectively	<p>Ogun state has comparative advantage for the following livestock</p> <ul style="list-style-type: none"> •Ruminants – cattle, sheep & goats •Poultry value chain. <p>Plateau state has comparative advantage for the following livestock</p> <ul style="list-style-type: none"> •Ruminants – cattle, sheep & goats •Poultry •Pork – piggery value chain
		Designated cattle Route	<p>Cattle and other farm animals graze openly but still confined.</p> <p>In Ogun state there is a pending bill yet to be signed into a law which allows regulated grazing i.e. grazing in specified areas like designated cattle route. This will prevent the trespasses from Pastoralists who prefer to graze their cattle on other people’s land.</p>
		Cattle fattening:	Local investors in Ogun state are currently into the experimental fattening of cattle. Feed formulations are given for 90 days for cattle and 50 days for goats and sheep while there is a considerable weight with zero grassing.
		Project support	There is a concern to know if the project is to support full industrial agriculture or just to empower small scale farming. This is because the latter is deemed will not be effective by the private operators.
Operational Challenges and Capacity Needs			
	2.	Odour	This is a major source of community complain once community encroach to allotted lands for livestock operations
		Women involvement:	There is no discrimination against women; they are fully involved in the livestock activities in the states.

	Livestock project supports	The state has a number of projects to increase livestock and poultry production and to empower people who are interested in going into the business. Project like the Odeda poultry project which has a capacity of 60,000 birds in a year. Also, the poultry multiplication centre in Owowo- Ijebu ode.
	Major livestock crises	The major crises are the outbreak to the avian Influenza which caused tremendous loss to the farmers in Plateau and Ogun State.
	Feed capacity support / Feed production	<p>The price of feed is very high and drives the cost of production up as feeding covers about 85% of the cost of production. Often feed materials like maize, soya beans, groundnut cake are sometimes imported to augment local supplies.</p> <p>Farmers do not have access to any feed mill within the farm estate or the immediate environment. They source for different feed materials and mix in their farms themselves.</p> <p>Furthermore, the cost of production varies often because the raw materials for the feed are always gotten from the middlemen sellers in the system.</p>
	Feed analysis problem:	<p>There is no standardization for the feed, individual compound their feed according to their knowledge and financial capacities.</p> <p>There is inadequate equipment to analyze some nutrient parameters like amino acids and metabolizable energy, particulate sizes and contaminants in feeds.</p> <p>Therefore, government needs to intervene especially in the area of production of feed crops.</p> <p>Any productive Intervention on livestock support should be linked with crop production and its standardisation else it will not be sustainable.</p>
	Poor breeding	Livestock farmer only depend on the herdsmen for their breeding stock. The breed variety available is poor in terms of production of both beef and milk. Therefore, the project should look into improving the breeding system and technology.

		<p>Poor market structure,</p> <p>Marketing awareness for egg and other meat products</p>	<p>The project should look into creating processing unit for livestock in order to increase the livestock markets. At present, there are no standard abattoirs for pig or cattle or poultry farmers which can help commercialize the meat and make it readily available to the public. This has made the transformation of livestock into various products backwards.</p> <p>This is adversely affecting the value chain of the livestock productions most especially the marketing. The current market approach for livestock (cattle, pigs' goat) is majorly on live weight sales.</p> <p>This is very important as the egg per capital consumption in Nigeria is very low as compared to that of other countries.</p>
		Market Glut	<p>Due to poor market structure available, farmers find it difficult to market their livestock and are forced to solely depend on off takers market that is almost a monopoly market and the farmers are weakened in negotiation because these off takers do not have competitors. Also, poor awareness is also a major cause of market glut though seasonal.</p>
		Trainings	<p>The project should look into training the farmers on breeding, artificial insemination, finance management etc.</p>
		Regulations	<p>Animal feeds should be properly regulated according to permissible standards</p> <p>On the management of disease outbreak, Small clusters may not favour poultry farmers on commercial basis in the event of disease outbreak which requires that all the birds in the affected farm should be eliminated, yet without compensation. The aspect of compensation and insurance needs to be factored into regulations.</p> <p>Environmental management agencies should establish clear standards on waste water treatment facility (WWTF) design and waste management particularly for livestock farms</p> <p>Government agencies and state universities should be provided with funds to pursue research on WWTF designs including those that are appropriate for small scale farms</p> <p>Improve consistency of implementation of environmental laws by local governments through better coordination with the national government.</p>
		Preferred areas of support for operation	<p>Provide tax incentives for livestock farmers who will comply with the law and/or generate energy and fertilizer from WWTF</p> <p>Indirect tax especially on equipment should favour livestock production most especially the local investors</p> <p>The challenge is financial support to carry out the prioritized programs.</p> <p>Need to find means of raising financial support beyond donor agencies and/ or the government budget; else the project momentum will be snuffed.</p>

		Wastes issues	<p><u>Solid waste</u> Droppings are sold and used as fertilizer, cow dung however are used as manure on pasture on the farms</p> <p>The mammalian dungs are rich in nutrient for manure. However, there is discrimination between cattle dung and pig dung. Pig’s dung manure is discriminated due to religious stigma on the animal, but poultry and cattle waste are sold off to farmers.</p> <p>Carcasses are incinerated, after investigations</p> <p>No proper system in place for waste management. Incinerators are obsolete</p> <p><u>Waste water</u> This is also a major problem within the livestock farm as water is a major constituent of the process. Most farm channel the waste water in a septic tank while some have an effluent treatment plant. Current operational practice of most pig farm channel their waste water to public road. Many of pig farms constructed do not have space provision for modern waste water treatment.</p> <p>For the LPRES, project, the cost of constructing waste water treatment facility (WWTF) with no clear commercial return for the farmer is regarded as disincentive.</p> <p>Furthermore, there is no price advantage for products from farms complying with environmental laws, nor lack of commercial incentives to comply for farmers especially for waste water treatment facility (WWTF) without biogas and electricity generation.</p> <p>Modern pig farms with high energy requirement for climate control will appreciate the benefits of generating electricity from biogas. cannot retrofit</p> <p><u>Odour Problem</u> A complaint from the community is about the stench generated from the livestock production and rearing. Majorly, the government should provide infrastructural support to aid local management of wastes.</p>
AGREEMENTS REACHED AT THE CONSULTATIONS WITH STAKEHOLDERS			
	1. The project and project objectives are relevant and timely to build capacity in the livestock industry. Whatever the support to be given, the feed component availability, standardization, analytical precision is important to the sustenance of the project		
	2. There is need to give adequate attention to capacity building in the areas of training in all aspects(cradle -grave) of the livestock production and processing , upscale the project and develop concrete programs for marketing and standardization of livestock products.		

4.3 Follow-Up Consultation with stakeholders

A second rounds of consultation was held as part of the development of this WMP and other safeguard instruments.

The purpose of the meetings was to

- (i) present the changes in scope of the proposed intervention to stakeholders
- (ii) obtain feedback on the proposed scope on LPRES interventions with particular focus on the E & S aspects of the intervention.

While recognizing that only 10 states have been currently admitted into the project during appraisal, the intention of Government to drive the implementation of the National Livestock Transformation Plan through LPRES was reflected in the profile of the participants at the public consultation meetings held. In all 17 states were consulted during the second round of consultation meetings held in December, 2021. The states which were consulted initially also participated in the second round of consultation.

Based on the stakeholder meetings held, the issues raised and how they were addressed are presented in Annex 8:

CHAPTER FIVE: LIVESTOCK VALUE CHAIN AND WASTE GENERATED

5.1 Introduction

In Nigeria, livestock production and value chain are under two major production systems: the sedentary mixed farming production system and the nomadic pastoral or agro-pastoral production system. In both systems waste management is crucial and plays a significant role in sustainable development of livestock value chain.

5.1.1. Why is Waste Management an Issue?

There are ecological, agricultural, public health, economic, and institutional contexts that define livestock waste problems in the quest to achieve sustainable development in livestock production. First is the fact that ‘Clean and green’ agriculture is of increasing importance in the marketing of livestock produce, both domestically and overseas, secondly the appropriate management of farm wastes can benefit farm operators by preventing:

- Negative impacting of property value;
- Contamination of the land and water on their farm;
- Breeding sites for disease spreading mosquitos, pest animals and predators;
- Contamination of farm produce;
- Stock injury, disease or death;
- Offensive odors to workers and neighbors;
- Large penalties and clean-up costs from poor waste management.

5.1.1.1. Livestock Systems interactions in Environmental Context

- Livestock, as part of global ecological and food production systems, are a key commodity for human well-being. Their importance in the provisioning of food, incomes, employment, nutrients and risk insurance to mankind is widely recognized (Herrero et al. 2010). In contrast, the interactions of livestock with its environment are complex and depend on location and management practices. Most traditional livestock production systems are resource driven, making use of locally available resources with limited alternative uses.
- The relationship between livestock production and greenhouse gas (GHG) emissions is widely recognized. As pointed out by Steeg and Tibbo (2012) agriculture contributes between 59% and 63% of the world’s non-carbon dioxide (non-CO₂) GHG emissions, including 84% of the global nitrous oxide (N₂O) emissions and 54% of the global methane (CH₄) emissions.
- Improperly managed animal waste can have severe consequences for the environment such as odor problems, attraction of rodents, insects and other pests, release of animal pathogens, groundwater contamination, surface water runoff, deterioration of biological structure of the earth and catastrophic spills (Sakar et al. 2009).

- High livestock density is always accompanied by production of a surplus of animal manure, representing a considerable pollution threat for the environment in these areas. Cattle are the largest contributors to global manure production (60%), while pigs and poultry account for 9% and 10%, respectively (Herrero et al. 2009).
- Recovery of nutrients from manure is highly variable and depends significantly on infrastructure and handling.
- Intensive animal production areas need suitable manure management, aiming to export and to redistribute the excess of nutrients from manure and to optimize their recycling. When untreated or poorly managed, animal manure can become a major source of air and water pollution. Nutrient leaching, mainly nitrogen and phosphorous, ammonia evaporation and pathogen contamination are some of the major threats (Holm-Nielsen et al. 2009)

5.1.1.2. Public Health Context

- Concentrated Animal Feeding Operations (CAFOs), release a significant amount of contaminants into the air and water. Adverse health effects related to exposure to these contaminants among CAFO workers have been well-documented; however, less is known about their impact on the health of residents in nearby communities. Epidemiological research in this area suggests that neighboring residents are at increased risk of developing neurobehavioral symptoms and respiratory illnesses, including asthma.
- Public health concerns associated with [CAFOs] include heightened risks of pathogens (disease- and non-disease-causing) passed from animals to humans;
- The emergence of microbes resistant to antibiotics and antimicrobials, due in large part to widespread use of antimicrobials for nontherapeutic purposes; food-borne disease; worker health concerns; and dispersed impacts on the adjacent community at large.
- Epidemiological studies have linked farm animal waste runoff to several waterborne outbreaks involving pathogens such as *Campylobacter*, *Salmonella*, *Listeria monocytogenes*, *Helicobacter pylori*, and *Escherichia coli* 0157:H7, as well as the protozoa *Cryptosporidium parvum*. See figure 5.1a and 5.1b.

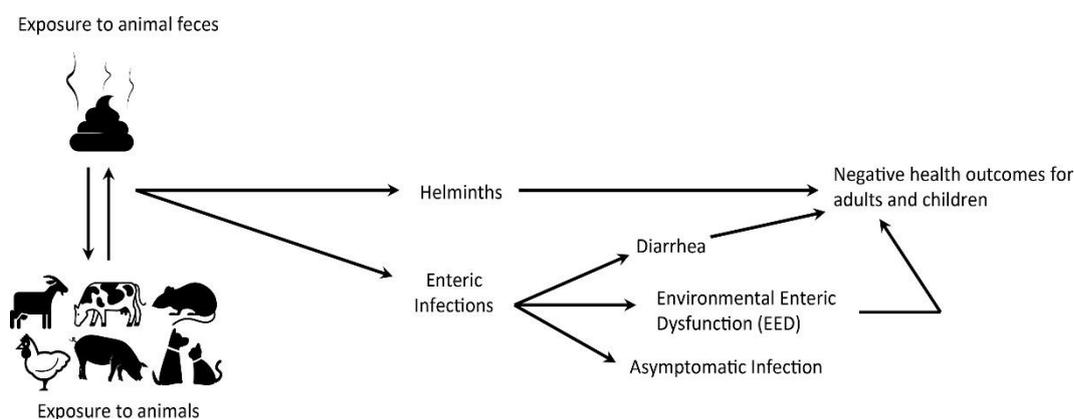


Figure 5. 1a: Exposure to animal faeces and/or contact with animals to human health.

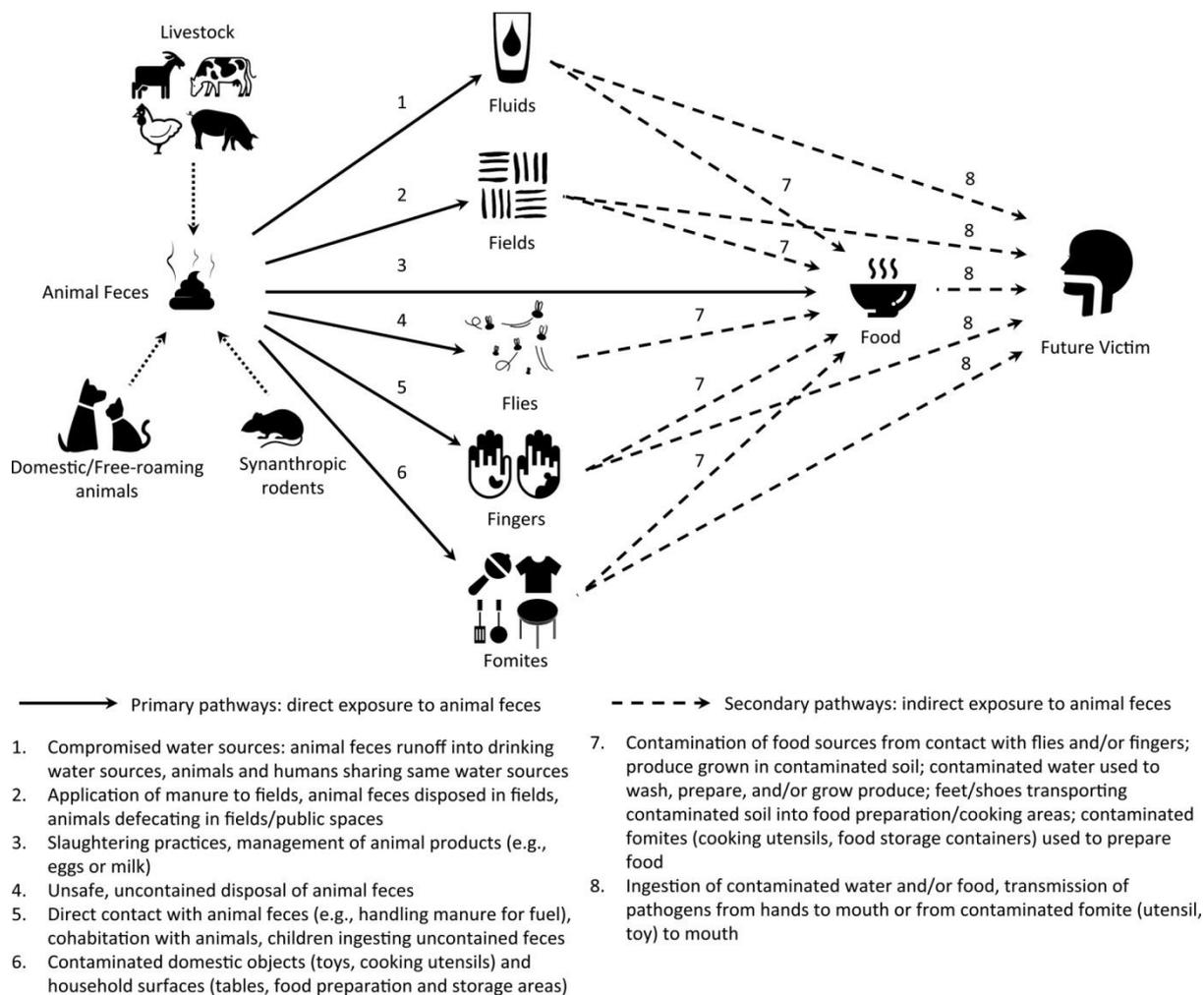


Figure 5. 1b: F-diagram showing transmission routes of animal faeces to humans. Adapted from Wagner, E.; Lanoix, J., Excreta disposal for rural areas and small communities.

- Excess nitrates in water have also been implicated in several health outcomes for susceptible populations. For instance, studies have found an association between high nitrate levels in water used in infant formula and development of methemoglobinemia, or blue-baby syndrome(baby skins turns blue) which is an illness associated with poor water supply contaminated with nitrates from fertilizers and manure.
- Animal confinement facilities also generate a variety of air contaminants, including skin cells, feed, fungi, and other particulates, which can become airborne. Additional contaminants include ammonia, hydrogen sulfide, and antimicrobials.
- A 2006 report by the Food and Agriculture Organization of the United Nations noted that, on a global scale, the animal agriculture sector accounts for approximately 18% of all anthropogenic greenhouse gas emissions.
- Many of the air pollutants in CAFOs do not currently have occupational exposure limits in Nigeria (see annex 1) Complicating the issue, contaminants released by CAFOs are often mixtures of a variety of pollutants. Very little is known about the risks these contaminant mixtures pose to human health, and even less is known about synergistic effects of such mixtures.

- The presence of a CAFO in or near a community can negatively impact the social structure of residents with respect to odor emanating from such farms.
- Evaluation of the strength of odors from farmed pigs in the homes of neighborhoods sited near the Gberigbe pig clusters reported mood disturbance related to exposure to malodorous compounds having their daily activities affected (either changing or ceasing the activities) due to the odor.

5.1.1.3 Current operational farm practices

At visited sites in the states, operational practices are indicated in plate 5.1, 5.2, 5.3 for the large ruminants, plate 5.8 for the small ruminants and plate 5.10, 5.12 and 5.13 for snails and poultry respectively. A review of the existing condition of waste management practices is summarized in table 5.1 for ruminants and table 5.2 for poultry.

5.2 The Structure of the Meat and Milk Value Chains

Figure 5.3 and 5.4 below show the various actors in the meat and milk value chains

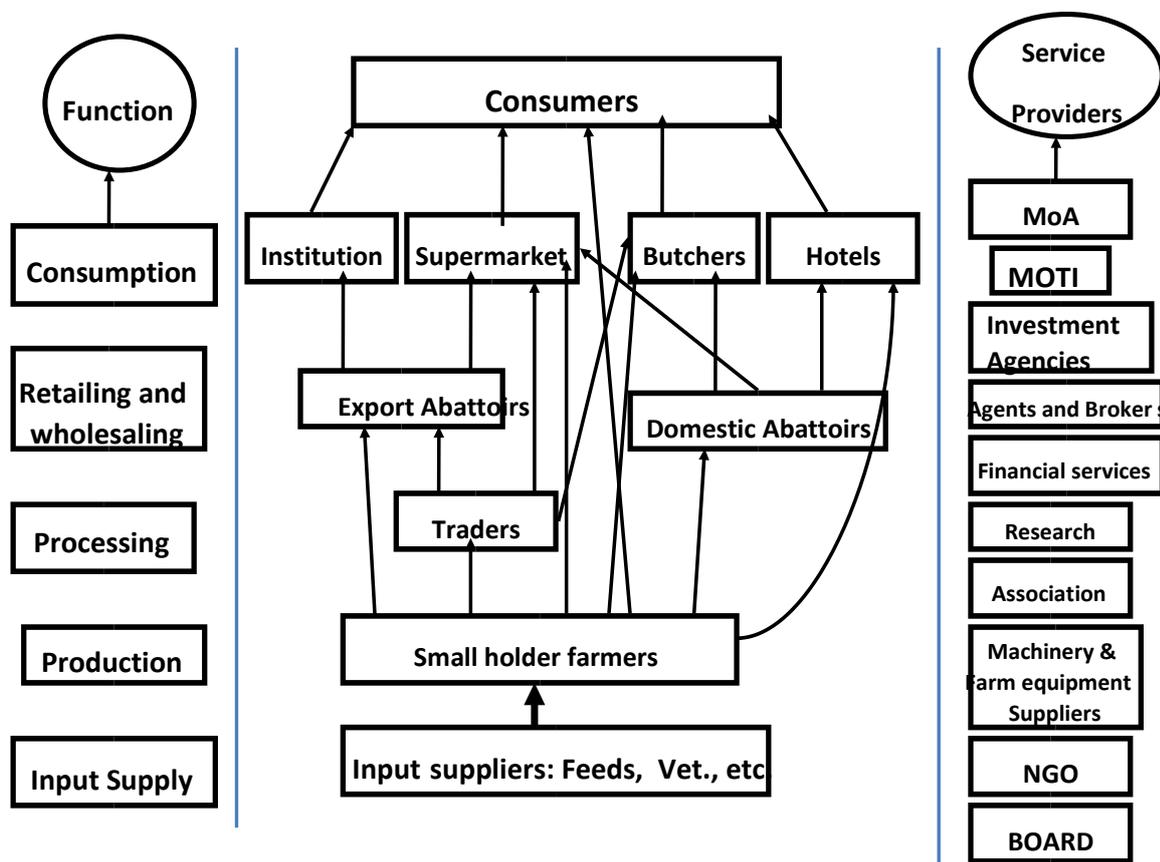


Figure 5. 2: Structure of the beef value chain

Source: Ilu. I.Y Frank. A. Annatte, I, Review of the Livestock/ Meat and Milk Value Chain and Policies influencing them n Nigeria. FAO, 2016

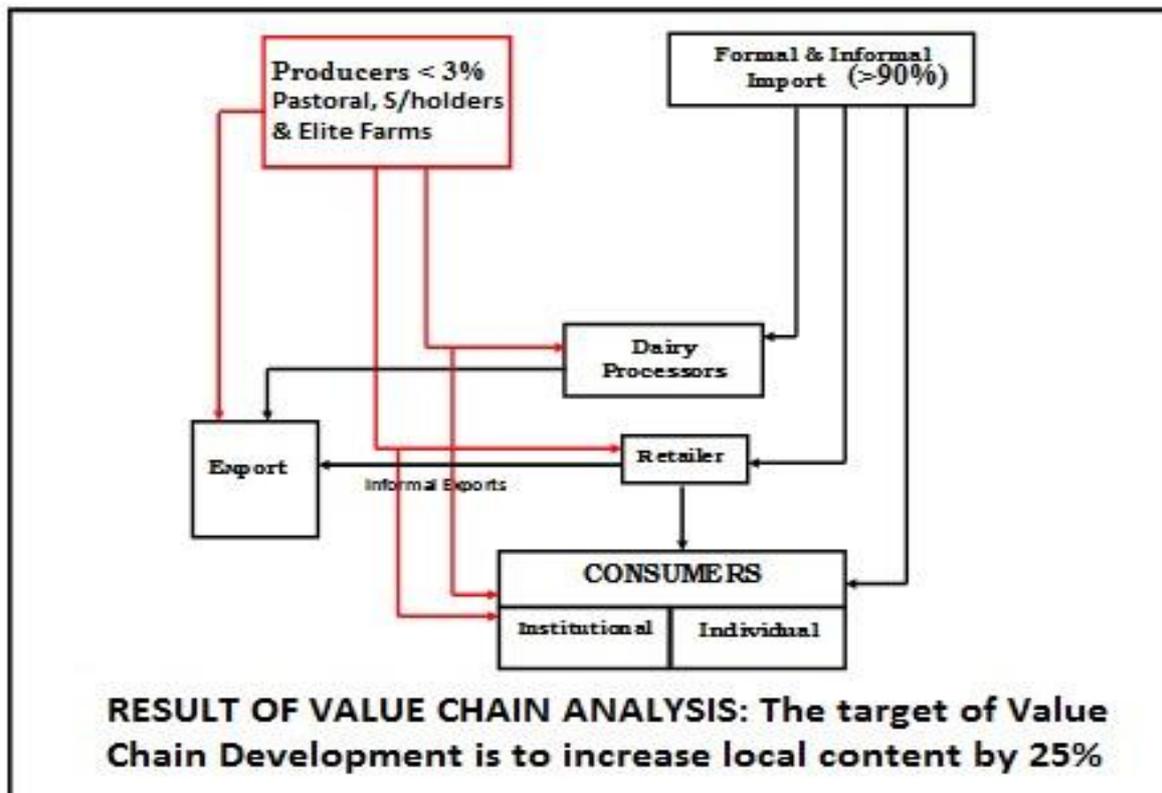


Figure 5. 3: Structure of the milk value chain

Source: Ilu. I.Y Frank. A. Annette, I, Review of the Livestock/ Meat and Milk Value Chain and Policies influencing them n Nigeria. FAO, 2016

5.3 Physical Flows of Meat and Milk among the Different Components (Actors)

The core functions in a beef value chain are inputs supply, production, trade (marketing), processing and consumption. These core functions involve different activities as indicated in Figures 5.4, 5.5 and 5.6 which provides details of the various activities performed.

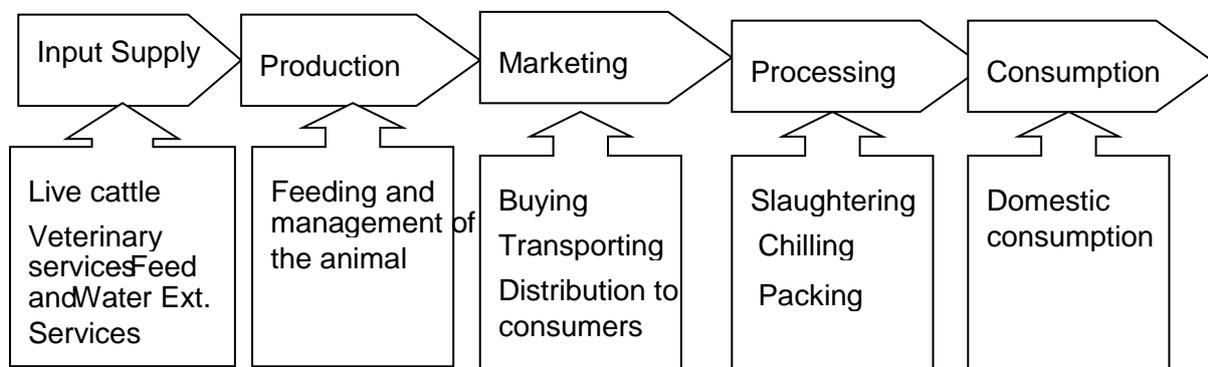


Figure 5. 4: Core functions of the beef value chain.

Source: Ilu. I.Y Frank. A. Annette, I, Review of the Livestock/ Meat and Milk Value Chain and Policies influencing them in Nigeria. FAO, 2016

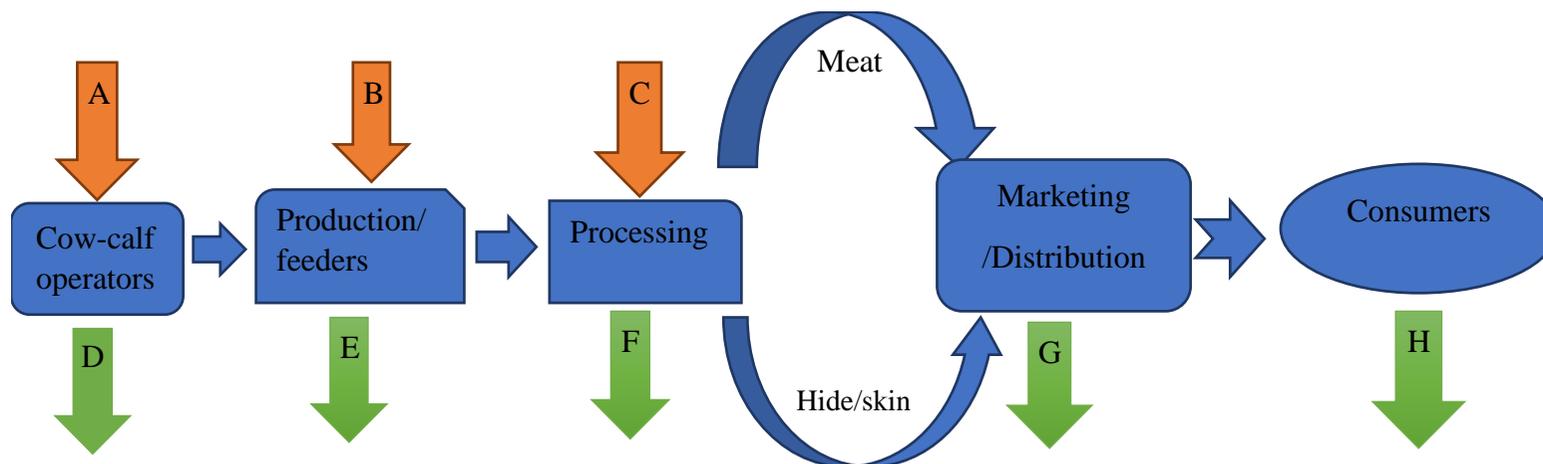


Figure 5. 5: Schematic Representation of Waste Generated along Meat Value Chain

Legend

Alphabet	Input	Content
A	Input	Feeds, animal health services and products
B	Input	Feeds, animal health services and products
C	Input	Water,
D	Waste output	Dead animals, waste water from animal wash, feed waste, feed bags(nylons), dungs, urine, vaccine, insecticides and drugs residue waste.
E	Waste output	Dead animals, waste water from animal wash, feed waste, feed bags (nylons), dungs, urine, vaccine, insecticide and drugs residue waste, and furs.
F	Waste output	Dungs, undigested ingest, waste water from meat processing, bones, horns, fats, blood, hooves, and furs
G	Waste output	Bones
H	Waste output	Bones

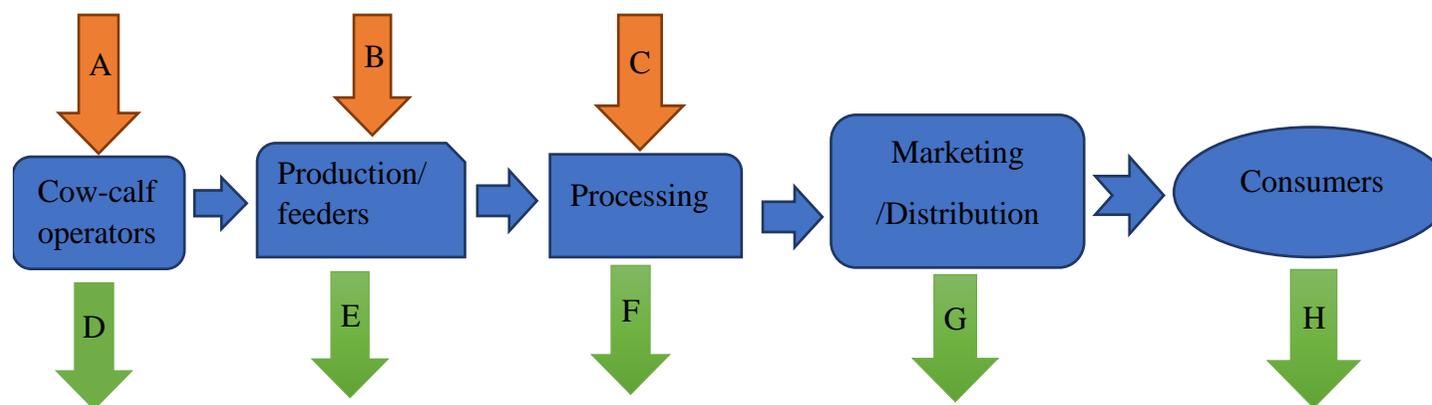


Figure 5. 6: Schematic Representation of Waste Generated along Milk Value Chain

Legend

Alphabet	Content
A	Input Feeds, animal health services and products
B	Input Feeds, animal health services and products
C	Input Water, soaps and sanitizers
D	Waste output Dead animals, waste water from animal wash, feed waste, dungs, urine, vaccine, insecticides and drugs residue waste syringe, bottles. feed bags (nylons)
E	Waste output Dead animals, waste water from animal wash, feed waste, dungs, urine, vaccine, insecticides, and drugs residue waste, and furs. feed bags (nylons)
F	Waste output Milk products residue waste, cleaning compounds and sanitizers, discarded cuts, spent ripening bags, wax residues from cheese production.
G	Waste output Waste milk
H	Waste output Waste from tins and sachets

Table 5. 1: Ruminants’ existing Livestock Waste Management Conditions

Waste Types	Waste Description	Generation	Storage	Treatment	Disposal	Potential Impact
Bio-hazardous waste	This is any waste containing potentially infectious substance. Examples are hypodermic needles, blades carcass of diseased animals, condemned vaccines. This waste is generated because of the diagnosis, treatment, or immunization of animals	Source segregation to reduce the volume of biohazardous waste	Waste are often left open	Mostly no treatment is done	Open dumping, burning.	These infectious materials can cause infection to humans. Zoonosis is one important aspect to consider in urban livestock keeping. For example, anthrax, brucellosis, cysticercosis, trichinosis among others is reported to be transmitted from animals to humans through inappropriate management practices for urban animal farming.
Hazardous chemical wastes	These are generated by veterinary procedures, animal house cleaning and sanitation. Chemicals like formaldehyde or chemotherapeutic agents. Pharmaceutical waste that is toxic or ignitable and sometimes pesticide for parasite control.	Waste generation can be reduced by buying and applying only required quantity of chemicals	Leftovers are often left in containers in the open or shelf or mixed with general waste	No treatment	Open dumping or burning	These compounds leach into the ground and find their ways into the water sources which is a public health risk
Plastic, nylon and paper waste	These are waste generated from packaging of feeds,	Alternative packaging materials can be explored to	Often mixed with general municipal	No treatment	Open dumping burning	This constitutes an environmental hazard as they block water ways.

	drugs, and other material in livestock production.	reduce waste generation	waste stream			
Organic wastes water (plate 5.6-5.7)	These are effluents from abattoirs and milk processing. They are very rich in organic content.	Source segregation should be done to reduce the amount of this waste. Blood, animal dung and gut content should be carefully removed from the water	No storage but direct discharge	No treatment	They are washed directly into the open drain and allowed to be washed into the nearest water course.	The waste contaminates water bodies with bacterial pathogens, ammonia, heavy metals and nitrate and raising the oxygen demands neighbourhood. Flies and insects' vectors (of diseases such as mosquitoes) proliferation are also major consequence of this waste
Bones, hooves, claws, horn,	This is generated during the animals processing	Source generation will support the secondary value of bones as a resource	Stacked in the open	Open drying	Direct burning or open dump or recycled and processed into animal feed	Burning of bones and hooves produced smoke which constitute air pollution which in turn can lead to respiratory disease among the neighbouring inhabitants
Condemned Organs, tissues, and dead animals	This is generated during the animals processing.	This generated waste can be reduced by avoiding overcrowding of animals.	-	-	The cultural practice is to bury dead animals for the protection of public health	The waste contaminates water bodies with bacterial Pathogens, ammonia, heavy metals and nitrate and raising the oxygen demands neighbourhood. Flies and insects' vectors (of diseases such as mosquitoes) proliferation are also major consequence of this
Animal dungs and	This is generated during the animals processing		In some areas the dungs may be		The main waste disposal practice is dumping at a	Waste utilization for urban food production can encourage transmission of faecal-oral infections including diarrhoea and dysenteries. It can also promote diseases associated with

gut content Plate 5.4,			compacted in a pile and stored in the open for a limited time		site which has piled up to form a refuse hill. Dung is piled up, used directly as manure for food production	rats such as plague, endemic typhus and rat bite fever.
Blood	This is generated during the animals processing				Collected as edible or Processed into Protein meal, or Discharged in wastewater	The waste contaminates water bodies with bacterial Pathogens, ammonia, heavy metals and nitrate and raising the oxygen demands neighbourhood. Flies and insects' vectors (of diseases such as mosquitoes) proliferation are also major consequence of this
Animal feed waste	This is generated during the feeding.	This is generated because of inefficient feeding system this can be reduced by using appropriate feeders for the animals.			The main waste disposal practice is dumping at a site.	
Methane, H ₂ S and Offensive odour	This is generated by the digestive process in the animals		-	-	-	At higher concentration they can be hazardous to human

The plates below (5.1-5.3) show different livestock in various states in Nigeria. Plate 5.1 shows Dairy Cattle in Integrated Farm in VOM, Plateau state, 5.2 shows new intakes of Cattle for ranching at Animal Care Konsult, Ogun State and 5.3 presents Pigs in Gberigbe- Ikorodu clusters.

Plates 5.4-5.6 shows different ways livestock waste are disposed in some existing farms. Plate 5.7 depicts wastewater taking over a road within the farm. While Plates 5.8 & 5.9 presents Grass cutter and Rabbit Farm Practices in Nigeria as well as the waste generated from them.

Plates 5.10 & 5.11 highlights the different Methods of Snail Farming Practices in Nigeria and the waste generated from them. However, Figure 5.8 shows waste stream generation points in the lifecycle of Poultry Livestock.



Plate 5. 1: Dairy Cattle in Integrated Farm in VOM, Plateau State.



Plate 5. 2: New intakes of Cattle for ranching at Animal Care Konsult, Ogun State



Plate 5. 3: Pigs in Gberigbe- Ikorodu clusters



Plate 5. 4: Current disposal methods of Pig Dung on Farm



Plate 5. 5: Brewery Waste used as feed stored on the farm



Plate 5. 6: Filled septic tank of wastewater within the farm



Plate 5. 7: Wastewater taking over a road within the farm



Plate 5. 8: Grass cutter and Rabbit Farm Practices in Nigeria.



Plate 5. 9: Waste Generated from Grass Cutter and Rabbit Farms





Plate 5. 10: Different Methods of Snail Farming Practices in Nigeria



Mould and Sand



Shells



Rotten leaves



Rotten eggs



Dead Snails

Plate 5. 11: Waste Generated on Snail Farms

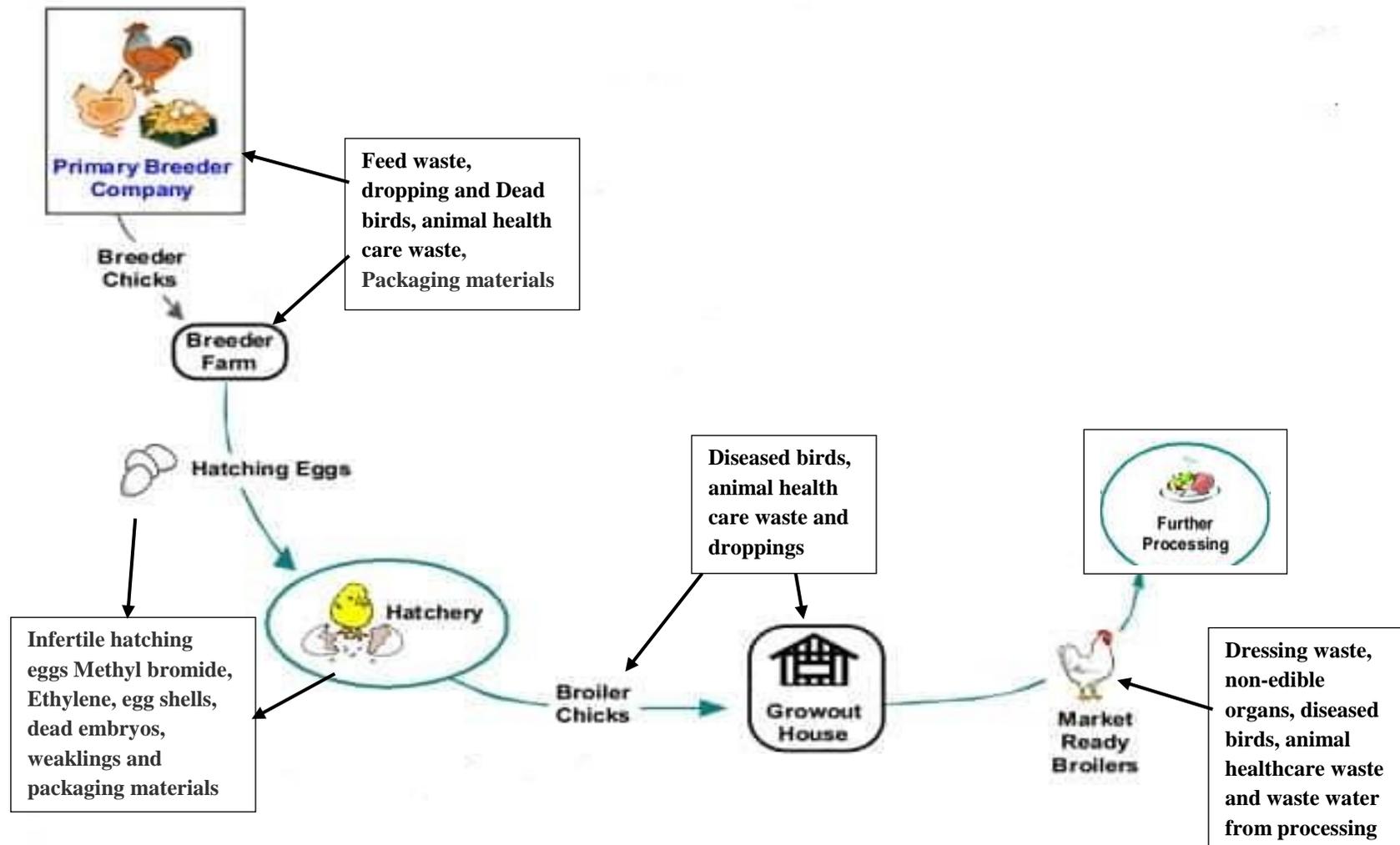


Figure 5. 8: Schematic representation of Waste Stream Generation Points in Poultry Livestock Lifecycle

Table 5.2 below presents the classes of poultry waste and the conditions in which they are currently managed

Table 5. 2: Classification of Poultry Waste and Existing Conditions

Waste Categories	Existing Conditions Management
Feed Waste	<p><u>Generation</u></p> <ul style="list-style-type: none"> ▪ This is majorly generated during feeding of the birds. A lot of the feed is wasted as the birds tend to spread the feeds with the feet and step on the feed-holder while trying to rush on the feed as shown in operational practice of plate 5.12. ▪ The package material for the feed gets torn easily thereby causing waste of the feed during transportation to the farm and even at the farm. <p><u>Handling/Storage / Collection</u></p> <ul style="list-style-type: none"> ▪ The feed waste is gathered together and stored in an open space as hill of waste. ▪ It is also stored in polyethene sacks before disposal or being sold. <p><u>Treatment / Disposal</u></p> <ul style="list-style-type: none"> ▪ Feed waste is majorly cleared outside the poultry farm and left to dry. However, after drying it is sold off to fish farmers who use it as feed for the fishes.
Droppings (plate5.14)	<p>The removal of dropping as stated above is done in case of deep litter and 3-tier reverse cage rearing but in case of battery cages, droppings are removed every day or once in two days to avoid filth in house.</p> <p><u>Generation</u></p> <ul style="list-style-type: none"> ▪ This is majorly generated as the birds excrete their waste after digestion. Most of this dropping is usually mixed with waste feed as well. <p><u>Handling/Storage / Collection</u></p> <ul style="list-style-type: none"> ▪ The droppings are stored for 3, 6 or 12 months till the disposal of batch of birds. ▪ The dropping stored mostly in pit at corner of premises, preferably on downwind flow side to avoid recontamination of birds. <p><u>Treatment / Disposal</u></p> <ul style="list-style-type: none"> ▪ <i>Oxidation ditches:</i> Aerobic fermentation of manure occurring in open ditches is the prominent disposal approach. Bacteria decompose organic matter into simpler substances. However, the liquid portion has NPK elements and is used as fertilizer in field. ▪ <i>Solid disposal:</i> The solid manure is handled as it is, in the form of heap. The stacked heap on compression generates heat inside and kills microbes making the material sterile, which is used as fertilizer as well but it is also used as fish feed.

Hatchery waste	<p>Considerable amount of waste material from hatchery is obtained which consists of infertile hatching eggs, dead embryos, egg shells from hatched eggs, dead chicks or weaklings and packaging materials. At this stage, it involves around 10-15 per cent loss of eggs or embryos during incubation and hatching and this is the reason for the considerable amount of waste.</p> <p><u>Generation</u></p> <ul style="list-style-type: none"> ▪ This is generated during the conversion of eggs into chicks. The waste is majorly egg shell, dead embryo, methyl bromide and Ethelene ▪ The package material used in the transportation of the newly hatched chick, chemical bottles of the methyl bromide and Ethelene. <p><u>Handling/Storage / Collection</u></p> <ul style="list-style-type: none"> ▪ Handling of raw hatchery by-products is difficult because of its strong off odour. To overcome this problem, various chemical treatments can be used including gaseous sterilant such as methyl bromide and ethylene oxide. ▪ The most important point to be considered during handling hatchery waste is that it should not contain high number of pathogens, which may pose difficulty to human health and risk for handlers. For preventing this, do not select eggs for hatching from diseased birds and remove dead embryos timely from incubator and try to keep embryonic morality at minimum possible level. <p><u>Treatment / Disposal</u></p> <ul style="list-style-type: none"> ▪ No formal form of treatment; ▪ Hatchery waste in the form of egg shells, dead embryos, infertile eggs, dead or weak chicks is mostly converted in hatchery by-product meal or hatchery residue meal which is also used as protein source for poultry feeding. Due to this it can be said as utilisation of hatchery waste instead of disposal of hatchery waste.
Dead Birds (Plate5.15a)	<p>Mortalities refer to dead poultry that are not marketable for human consumption. Proper disposal of dead birds is extremely important to protect the health of both people and livestock.</p> <p><u>Generation</u></p> <ul style="list-style-type: none"> ▪ Large commercial poultry operations are subject to mortality rates from 2-5% and therefore generate many carcasses for disposal due to infection with diseases such as metabolic and nutritional diseases, infectious diseases; parasitic diseases; and behavioural diseases. <p><u>Handling/Storage / Collection</u></p> <ul style="list-style-type: none"> ▪ It is observed that in many instances, dead birds are just thrown away in open outside the farm on fallow land or at the corner of premises; worse situations arise during critical periods of outbreaks, due to more number of dead birds posing difficulties for systematic disposal. <p><u>Treatment / Disposal</u></p>

	<ul style="list-style-type: none"> ▪ Dead birds are not given any form of treatment; ▪ Dead birds are mostly buried while some incinerate them.
<p>Dressing waste</p> <p>Plate 5.15b)</p>	<p>On the farm, dressing waste is not a severe issue as much as other form of waste because major sales are live-whole selling. However, poultry farms with processing section who dresses birds for domestic use or retailed dressed birds generated this waste.</p> <p><u>Generation</u></p> <ul style="list-style-type: none"> ▪ This is waste generated during bird processing. <p><u>Handling/Storage / Collection</u></p> <ul style="list-style-type: none"> ▪ Dry dressing waste such as feathers shanks are stored in a waste pit collection point; ▪ Wet dressing waste is disposed-off into decomposition pit immediately. <p><u>Treatment/ Disposal</u></p> <ul style="list-style-type: none"> ▪ No form of treatment; ▪ Dry wastes are burnt openly while the wet wastes are buried for decomposition.
<p>Animal Health Care Products</p>	<p>These are spent medicines, empty containers, expired vaccines, used needle, and used vaccine bottles.</p> <p><u>Generation</u></p> <ul style="list-style-type: none"> ▪ These wastes are generated during treatment, or immunization of the birds. <p><u>Handling/Storage / Collection</u></p> <ul style="list-style-type: none"> ▪ Stored in general waste collection bin. <p><u>Treatment / Disposal</u></p> <ul style="list-style-type: none"> ▪ No form of treatment; ▪ Disposed along with the general waste and burn openly.
<p>Packaging Materials</p>	<p>These are material used packaging all the poultry products.</p> <p><u>Generation</u></p> <p>These wastes are generated from all goods coming into the poultry and also from the egg and hatchery section of the poultry.</p> <p><u>Handling/Storage / Collection</u></p> <ul style="list-style-type: none"> ▪ Stored in general waste collection bin or waste pit within the premises. <p><u>Treatment / Disposal</u></p> <ul style="list-style-type: none"> ▪ No form of treatment; ▪ Some are reused within the poultry;

	<ul style="list-style-type: none"> ▪ Some are disposed with the general waste or burn openly.
Waste water	<p><u>Generation</u> This is mainly generated from the poultry processing section and during the cleaning of the bird cages.</p> <p><u>Handling/Storage / Collection</u></p> <ul style="list-style-type: none"> ▪ Stored in septic tank within the farm and while some are channelled into open drains. <p><u>Treatment / Disposal</u></p> <ul style="list-style-type: none"> ▪ No formal treatment; ▪ Channelled to septic tank or public drain;
Chemical waste	<p><u>Generation</u> This is generated from the hatchery section. It is used to control the strong off odour.</p> <p><u>Handling/Storage / Collection</u></p> <ul style="list-style-type: none"> ▪ No formal storage <p><u>Treatment / Disposal</u></p> <ul style="list-style-type: none"> ▪ No formal treatment; ▪ Washing of the floor / hatchery section into septic tank or public drain.



Plates 5.12 & 5.13 below presents the different methods of poultry farming practises in Nigeria



Plate 5.14 shows pictures of different types of waste generated from a poultry farm
 (a) Litter such as sawdust and wood shavings (b) Birds Excreta/ Droppings



(a) Wood shavings



(b) Peanut or rice hulls



© Farm mortalities (d) Bird Feathers
 Plate 5. 15: Different types of waste generated from a poultry farms

5.4 Review of Existing Waste Management Plan Initiatives, Practices Achievements and Challenges in Nigeria

As outlined in table 5.2 and 5.3 above, evaluation of livestock waste generation and management practices among selected farms in Nigeria was carried out. It has been ascertained that currently there is no best livestock management practice in Nigeria, due to poor waste disposal and treatment methods, lack of utilization and insufficient education in utilization skills.

The locations of many livestock farms encourage pollution of surface water. About 53% of the farms were located near rivers or streams. A few of the farms treat their livestock waste using chemical and physical treatments while a greater percentage (82.5%) of the farms do not treat the waste litter before disposal.

Specifically, Poultry litter is yet to find full utilization by the poultry farmers and the public. A few current applications include fish feeding (5.9%) and manure/fertilizer (21.9%). Quantification of the litter generated was uncommon in a majority of the farms (12.6%). Open dumping of the litter at some meters away from the farms is the common method of disposal (89.3%). Other initiatives existing include the use of composting, biogas generation and incineration at many pilot operations.

With the processing facilities, technologies exist to significantly reduce emissions from processing plants. The problem is one of the cost and corresponding incentive and regulatory framework. Because of the high BOD-load in the wastewater of tanneries, dairies and slaughterhouses, anaerobic systems are the most suitable waste water purification systems.

Simple anaerobic systems could cut the BOD contents by half, while more sophisticated anaerobic systems reach 90 percent BOD-purification. Wastewater treatment usually first separates solids from the liquid, followed biological treatment under anaerobic conditions (lagoons). Then, chemical or physical processes such as adsorption, stripping or coagulation remove nutrients such as phosphorus. The same process serves to remove the remaining BOD as well as pathogens. In a few developed countries, environmental problems have already led to high quality standards being required for discharge water. To meet these standards, a combination of anaerobic and aerobic treatment is required, often coupled with nutrient removal systems.

As most of the air pollution is related to fossil energy consumption, prevention to reduce environmental pollution is even more important for air pollutants than for wastewater. There are methods to treat polluted air, although generally at high cost.

5.4.1 Biogas as a Sustainable Solution to Energy and Waste Management Challenges in Nigeria

One of the beneficial and advantageous processes in manure treatment is anaerobic digestion (AD). The AD of various organic feedstock, predominantly animal manures and municipal wastewater sludge produce a methane rich gaseous mixture called biogas that is of added benefit to farm livestock manure as an energy resource. The older uses of the technology were for the treatment of sewage sludge and agricultural manures.

The generation of biogas from the AD of biomass is a technology which can produce sustainable energy and also reduce the environmental risks associated with manure and waste management as indicated in. **These and other benefits of biogas systems are indicated in table 5.3 below.** Biogas is produced by bacterial conversion of organic matter under anaerobic conditions and is a mixture of carbon dioxide (CO₂) and the flammable gas methane (CH₄) (Jiang et al. 2011). The biogas produced, consists of methane (50–80%), carbon dioxide (20–50%) and traces of, for example, hydrogen sulphide (0–0.4%) (Lantz et al. 2007). The Potential Biogas Derivable from Biomass Generated in Nigeria is outlined in table 5.4 while table 5. 5 indicates estimated Biofertilizer (dry) Derivable from Biomass Generated in Nigeria. Bond and Templeton (2011) clearly express the benefits of the use of biogas: “Biogas technology offers a unique set of benefits. It can improve the health of users, is a sustainable source of energy, benefits the environment and provides a way to treat and reuse

various wastes – human, animal, agricultural, industrial and municipal. Figure 5.9 below presents an overview of the waste management and biogas systems used in livestock systems

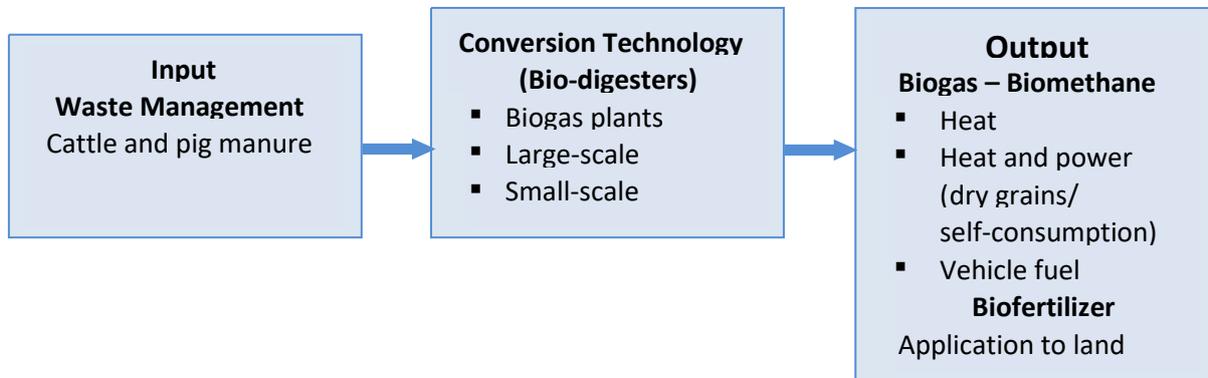


Figure 5. 9: Overview of the waste management and biogas systems in livestock systems

According to IEA 2001 there are several benefits resulting from the use of AD (biogas) technology.

Table 5. 3: Benefits resulting from the use of biogas systems

WASTE TREATMENT BENEFITS	NATURAL WASTE TREATMENT PROCESS
Disposal Space	Requires less land than aerobic composting or landfilling
	Reduces disposed waste volume and weight to be landfilled
Energy Benefits	Net energy producing process
	Generate high quality renewable fuel
	Biogas proven in numerous end-use applications
Environmental Benefits	Significantly reduces carbon dioxide and methane emissions
	Eliminates odours
	Produces a sanitized compost and nutrient rich liquid fertilizer
	Maximizes recycling benefits
Economic Benefits	Is more cost-effective than other treatment options from a life-cycle perspective

Source. Adapted from IEA 2001.

Table 5. 4: Potential Biogas Derivable from Biomass Generated in Nigeria

Organic waste (biomass)	Number of Units (millions)	Total biomass generated (million tons year ⁻¹)	Estimated biogas potential (billion m ³ year ⁻¹)
Cattle excreta	21	197.6	6.52
Sheep and goat excreta	100.9	39.6	2.3
Pig excreta	9.6	15.3	0.92
Poultry excreta	112.9	32.6	2.5
Abattoir waste	-	83.3	4.42
Human excreta	130	52	2.6
Crop residue	-	83	4.98
Municipal solid waste (MSW)	-	39.1	1.29
Total		542.5	25.53

Table 5. 5: Estimated Biofertilizer (dry) Derivable from Biomass Generated in Nigeria

Organic waste (biomass)	Total biomass generated (million tons year ⁻¹)	Dry mass (DM) of biomass generated (million tons year ⁻¹)	Volatile solids (VS) of DM (million tons year ⁻¹)	Estimated Biofertilizer (dry) potential (million tons year ⁻¹)
Cattle excreta	197.6	49.4	39.52	25.69
Sheep and goat excreta	39.6	7.13	5.7	3.71
Pig excreta	15.3	3.06	2.3	1.68
Poultry excreta	32.6	3.26	2.28	1.89
Abattoir waste	83.3	12.5	10.63	6.12
Human excreta	52	13	10.92	6.45
Crop residue	83	73.87	62.79	36.2
Municipal solid waste (MSW)	39.1	11.73	8.8	6.45
Total	542.5	173.95	142.94	88.19

Adapted from paper presentation on biogas as a solution for the National Energy Globe Award 2017.

5.4.1.1 Achievements

Some successful pilot biogas projects in place are listed below and an ongoing effort to fabricate a biogas plant at a farm site is indicated in [plate 5.16](#).

- **Abattoir Biogas Project:** Biogas production from slaughter house waste to generate electricity, heat and cooking gas on site.
- **Biogas & solar food Dryer:** The biogas plant uses cassava and cow dung as feedstock for the dryer.
- **Poultry waste to electricity and Organic fertilizer**
- **Kirikiri Maximum Prison** – 200 m³ human waste Biogas Plant for cooking gas and organic fertilizer production.



Plate 5. 16: Biogas Plant under construction by one of the farmers

5.4.1.2 Challenges

Despite the outstanding achievements, in Nigeria, biogas technology has remained at the level of institutional research work and pilot schemes particularly in rural and small-scale biogas production at the states and local government levels, some of the problems and challenges to biogas industry remain as follows:

- Some biogas plants are in fact underutilized. This development can be attributed to the poor economic benefits resulting from the low integrative utilization rate of biogas production and the unstable supply of raw materials caused by fluctuations in livestock breeding;
- Inferior equipment technology and low level of industrialization. Low manufacturing, lack of species, poor durability, and inadequate product support are just some of the problems confronting the biogas production industry;
- Policies and incentives need to be improved, and subsequent service abilities must be strengthened. Policies, regulations, and standards for the construction and integrative utilization of large and medium-scaled biogas plants are currently far from industry standards;

- Faulty market impacts on integrated benefits of biogas which have yet to be felt. In turn, problems such as weak demand and an immature biogas market, deficiency in matched measures and market orientation, and long-term payback period have been highlighted.

5.4.2. Incinerators

Current farm operations have livestock carcass incinerators (plate 5.17) which use liquid fuel—diesel, propane, or natural gas— to support high temperature combustion that reduces carcasses to ash and gaseous emissions. The primary benefits of incineration are rapid and timely disposal, minimal operational labour, and ability to rapidly destroy pathogens.



Plate 5. 17: Existing types of Incinerators on Livestock Farms

The incinerators are designed for on-farm disposal of routine mortalities and usually inadequate to handle surges caused by disease or other catastrophic events.

5.4.3. Engineered landfill

Other than the use of biogas or incinerator is outright disposal of livestock mortalities in dumpsite/ engineered landfills. The benefit of using engineered landfills for disposal is that these facilities are carefully sited to avoid environmentally sensitive areas and are constructed with leachate containment and/or treatment systems that substantially reduce the risks of soil and groundwater contamination.

Under the current practice the local government area / municipal landfills often do not have sufficient excavating capacity, or stockpiles of cover soil, to handle large volumes of livestock during an emergency. Furthermore, animal remains are difficult to compact, making proper construction of landfill cells difficult unless large quantities of more stable solid waste are available to bury with the carcasses.

CHAPTER SIX: IMPACT OF VETERINARY AND LIVESTOCK WASTE AND MITIGATION MEASURES

Associated waste impacts and sanitary nuisances from livestock operations needs to be mitigated through good husbandry practices and a proper farm management to avoid any inconveniences to the surrounding environment. Major issues of environmental concern will relate to, zoning and site selection, solid waste, odour and sanitary nuisances, wastewater, health and safety aspects, and energy and water consumption.

With respect to generated waste on farm, there are two broad categories namely Non - hazardous and hazardous.

6.1 Non-Hazardous Waste

6.1.1 Feed Waste

Waste examples: Livestock feed includes hay, grain (sometimes supplemented with protein, amino acids, enzymes, vitamins, mineral supplements, hormones, heavy metals, and antibiotics), and silage.

Generation: Feed can be unusable waste material if spilled during storage, loading, and unloading or during animal feeding.

Impact: Waste feed, including additives, may contribute to the contamination of storm water runoff, primarily because of its organic matter content.

Mitigation measures:

Minimizing the waste generation

-Promote efficient storage, handling and use of feed by maintaining records of feed purchases and livestock feed use;

-Use covered or protected feeders to prevent feed from exposure to rain and wind;

- Maintain feeding systems in good working condition to prevent spills and feed contact with the ground;

Disposal: Consider mixing of waste feed with other recyclable materials destined for use as fertilizer. Incineration or land disposal options should be considered depending on an assessment of potential impacts of each option to air, soils, and surface water / groundwater. Incineration only should be considered for feed waste with potentially high impact on the environment.

6.1.2 Animal Waste

Mammalian livestock production operations generate significant quantities of animal waste, mainly in the form of un-metabolized nutrients excreted as manure and undigested intestinal content during the meat processing in abattoir.

Waste Example: Manure, contents of the rumen and intestines

Generation: Most of the animal waste is generated at housing, feeding, and watering locations and during meat processing at abattoir. Animal wastes can be either liquid, slurry, or solid.

Impact: Manure contains nitrogen, phosphorus, and other excreted substances which may result in air emissions of ammonia and other gases and may pose a potential risk of contamination to surface or groundwater resources through leaching and runoff. Manure also contains disease-causing agents such as bacteria, pathogens, viruses, parasites, and prions which may also potentially affect soil, water, and plant resources (for human, livestock, or wildlife consumption). Most of the animal waste is generated at housing, feeding, and watering locations. Animal wastes can be either liquid, slurry, or solid, depending on the solids content. Animal waste management systems involve the collection, transport, storage, treatment, and utilization (rather than disposal) of the waste to reduce such adverse impacts

Mitigation measures:

A. Minimizing the waste generation

- Implement a comprehensive nutrient and waste management plan that considers the potentially harmful constituents of this waste including potential phytotoxicity levels, potential concentration of hazardous substances in soils and vegetation, as well as nutrient limits and groundwater pollutant limits;
- Observe internationally recognized guidance, such as that published by FAO, on land requirements for livestock production for livestock units (LU) per hectare (ha) to ensure an appropriate amount of land for manure deposition;
- Match feed content to the specific nutritional requirements of the animals in their different production and growth stages;
- Use low-protein, amino acid-supplemented diets (e.g. a 1 percent reduction in the protein content of pig feed may result in a 10 percent reduction in the amount of nitrogen excreted);
- Grind feed to increase utilization efficiency by the animals, allowing the use of less feed and thereby reducing the amount of manure generated (as well as increasing the production efficiency);
- Use low-phosphorus diets with highly digestible inorganic phosphates;
- Use quality, uncontaminated feed materials (e.g. concentrations of pesticides, dioxins, and so on are known and do not exceed acceptable levels) that contain no more copper, zinc, and other additives than is necessary for animal health;

- Curtail animal feeding 12 hours before slaughtering to reduce manure production and reduce the risk of contamination of the carcasses with manure and digestive tract content during slaughter;
- Provide sufficient manure storage capacity until the manure is transported for agricultural and other uses;
- Collect and compost stomach and intestinal contents and manure (preferably removed in “dry” form without mixing into the effluent and provided it does not come from diseased animals) for use as compost or other agricultural application. In the case of bovine slaughter, the cattle’s first stomach has a considerable organic material content (approximately 10, 40, and 50 kg for veal calves less than one-year-old, bulls, and cows, respectively).

Storage

- Adequate storage capacity is related to the size of facility, livestock units, length of storage and consideration of high rainfall and flood conditions ;
- Ensure production and manure storage facilities are constructed to prevent urine and manure contamination of surface water and groundwater (e.g. use concrete floors, collect liquid effluent from pens, and use roof gutters on buildings to collect and divert clean stormwater);
- Keep waste as dry as possible by scraping wastes instead of, or in addition, to flushing with water to remove waste;
- Reduce the amount of water used during cleaning (e.g. by using high-pressure, low-flow nozzles);
- Minimize the surface area of manure in storage;
- Cool the manure surface to maintain temperatures at 15°C or less (e.g. by using cooling fins on the manure surface), if practical, to reduce ammonia emissions;
- Locate manure stacks away from water bodies, floodplains, wellhead fields; or other sensitive habitats;
- For feedlots, ensure that solid waste (e.g. bedding and muck) is gathered regularly and is not permitted to lie on the ground for long periods of time;
- Reduce the volume of rainwater in the storage system by covering slurry tanks or lagoons with a rigid roof or floating cover and by placing dry manure or litter in a covered or roofed area;
- Check for storage systems leakage regularly (e.g. inspect tanks for corrosion of seams, especially those near ground level; annually empty and inspect tanks);
- Use double valves on outlets from liquid tanks to reduce the probability of release;
- Conduct manure spread only as part of well-planned strategy that considers potential risks to health and the environment due to the presence of chemical and biological agents as well as nutrient balance in an agricultural setting.
- Manure storage facilities should have capacity for 9–12 months of manure production or as necessary to avoid over application;

- Design, construct, operate, and maintain waste management and storage facilities to contain all manure, litter, and process wastewater including runoff and direct precipitation **enough to withstand a 24 hour 10 to 25-year rainfall; Designing, constructing and maintaining manure storage facilities is a large expense to the farmer.**

Treatment

- Remove liquids and sludge from lagoons as necessary to prevent overtopping;
- Build a reserve slurry storage lagoon;
- Transport liquid effluent in sealed tank

Disposal:

Manure can be applied to agricultural land only during periods that are appropriate for its use as plant nutrient (generally just before the start of the growing season).

6.1.3 Animal Carcasses

Waste examples: Dead animals and parts

Generation: Mortalities are a normal part of animal husbandry and from diseased livestock.

Impact: Animal carcasses can initiate the spread of disease and odours, and to avoid the attraction and multiplication of vectors Livestock producers may dispose of mortalities from their own farms through one of the following means:

- Dead animal collection service
- On-farm disposal by: - Composting - Incineration, or - Burial

Mitigation measures:

- Minimizing the waste generation by reducing mortalities through proper animal care and disease prevention;
- Where burial is the option adopted for disposal, all dead animals should be disposed of by deep burial with the application of quick lime in a dedicated site within farm premises to the satisfaction of the Environmental Health Officers and the Ministry of Agriculture inspectors as applicable.
- The burial area should have stable and low permeability soils.
- There should be setback between burial site and water courses/bodies
- Burial sites should be located a minimum of 30 m from each other.
- Burial sites should be well distributed around a property.
- No more than one large animal carcass should be placed in each burial site. No more than 700 kg of mortalities should be buried per hectare per year. Once a burial site is used, it should not be reused for at least three years.

Storage

- Collecting animals not approved by veterinary inspection and segregating them from animal materials sent by the slaughterhouse for off-site rendering.
- This segregation is necessary because the treatment processes in off-site rendering plants can entail higher pressure, temperature, and duration, in accordance with the risk classifications of the waste materials ;
- Storing carcasses until collection to prevent putrefaction, odours, and attraction of vectors, using cooling if necessary ;
- Transformation in a bio-gas or composting plant after pressure sterilization;
- Using a reliable collection company approved by local authorities that disposes of carcasses by rendering, with adequate time, temperature and pressure criteria for sanitization, or incineration/co-incineration depending on the cause of fatality;
- Storage times should be minimized to avoid energy intensive cooling requirements;
- Store carcasses until disposal, using cooling if necessary to prevent putrefaction.

Disposal

- Separated SRM (Special Risk Materials) should be destroyed through incineration with a minimum gas temperature of 850 °C. Prior to incineration, the material should be reduced to an appropriate particle size and heat-treated according to defined combinations of time, temperature and pressure;
- Use a reliable collection company approved by local authorities that disposes of carcasses by rendering or incineration, depending on the cause of fatality;
- Incineration should only be conducted in permitted facilities operating under international recognized standards for pollution prevention and control.

6.1.4 Wastewater

Livestock operations most commonly generate non-point source effluents due to runoff from feed (including silage) storage, loading, and unloading, livestock housing, feeding, and watering, waste management facilities, and areas of land application of manure. Depending on the type and intensity.

Impact

Effluents have the potential to contaminate surface water and groundwater with nutrients, ammonia, sediment, pesticides, pathogens and feed additives, such as heavy metals, hormones, and antibiotics. Effluents from livestock operations typically have a high content of organic material and consequently a high biochemical oxygen demand (BOD) and chemical oxygen demand (COD), as well as nutrients and suspended solids (TSS).

Mitigation

Minimizing the waste generation, the following measures are proposed:

- Reuse water used for cleaning milking equipment to clean the milking parlour;
- Reduce water use and spills from animal watering by preventing overflow of watering devices and using calibrated, well-maintained self-watering devices;
- Install vegetative filters to trap sediment;
- Install surface water diversions to direct clean runoff around areas containing waste;
- Implement buffer zones to surface water bodies, avoiding land spreading of manure within these areas;
- Reduce leachate from silage by allowing plant material to wilt in the field for 24 hours, varying cutting and harvesting times, and adding moisture-absorbent material as the silage is stored.
- Prioritize the removal of solid waste before it enters the wastewater stream:
- Use floor drains and collection channels with grids, screens, and / or traps to reduce the amount of solids entering the wastewater stream collect blood for use in food, feed or in the pharmaceutical industry.
- Manure from the stockyard and from vehicle cleaning should be removed while in solid form;
- Stomach and intestine contents should be removed and transported in a dry state by pumps, screw conveyers or trolleys to outdoor storage and collection points for further recycling. Offal should be transported by vacuum or compressed air systems;
- Prevent direct runoff to water courses, especially from lairage and manure storage areas;
- Apply appropriate tank and equipment cleaning procedures. Clean in place (cip) cleaning procedures are useful to reduce chemical, water and energy consumption in cleaning operations;
- Choose cleaning agents that do not have adverse impacts on the environment in general, on wastewater treatment unit processes, or on sludge quality for agricultural application. Prevent the use of agents that contain active chlorine or prohibited, banned or restricted chemicals.
- Optimize agent use through correct dosage and application (e.g. Cip);
- Implement integrated pest and vector management programs and maximize vector control through mechanical means (e.g. Traps, and use of mesh on doors and windows) to avoid or minimize the introduction of chemicals potentially harmful to the wastewater treatment process or the sludge quality.

Process Wastewater Treatment

Techniques for treating industrial process wastewater in this sector include sedimentation for suspended solids reduction using clarifiers or settling ponds; flow and load equalization; biological treatment, typically anaerobic followed by aerobic treatment, for reduction of soluble organic matter (BOD); biological nutrient removal for reduction in nitrogen and

phosphorus; chlorination of effluent when disinfection is required; dewatering of residuals and composting or land application of wastewater treatment residuals of acceptable quality. Additional engineering controls may be required (i) if pass through of active ingredients (residual amounts of growth enhancers and antibiotics, among other hazardous constituents) is an issue, and (ii) to contain and neutralize nuisance odours.

6.1.5 Air Emissions

Waste examples and Generation: Air emissions from mammalian livestock production include ammonia (e.g. management of animal waste), methane and nitrous oxide (e.g. animal feeding and waste management), odours (e.g. animal housing and waste management), bioaerosols, and dust (e.g. feed storage, loading, and unloading, feeding, and waste management activities).

Impact of Ammonia and Odours

Ammonia gas and other sources of odour are generated primarily during denitrification of manure and can be released directly into the atmosphere at any stage of the manure handling process, including through ventilation of buildings and manure storage areas. Ammonia gas levels are also affected by the ambient temperature, ventilation rate, humidity, stocking rate, litter quality, and feed composition (crude protein). Ammonia gas (NH₃) has a sharp and pungent odour can act as an irritant when present in high enough concentrations. Ammonia gas deposition into surface waters may contribute to their eutrophication. Release of ammonia gas also reduces the nitrogen content and, therefore, the fertilizer value of the manure.

Mitigation of Ammonia & Odour:

- Consider the siting of new facilities taking into account distances to neighbours and the propagation of odours;
- Control the temperature, humidity, and other environmental factors of manure storage to reduce emissions;
- Consider composting of manure to reduce odour emissions;
- Reduce emissions and odours during land application activities by applying a few centimetres
- below the soil surface and by selecting favourable weather conditions (e.g. Wind blowing away from inhabited areas);
- If necessary, apply chemicals (e.g. urinate inhibitors) weekly to reduce conversion of
- nitrogen to ammonia;

Impact of Greenhouse gases

Generation and waste type: The livestock account for 9 percent of anthropogenic CO₂ emissions (mostly from deforestation / land use changes for grazing and pasture for feed crops), 37 percent of anthropogenic methane emissions, mostly from enteric fermentation by ruminants, and 65 percent of anthropogenic nitrous oxide emissions, the majority of which from manure. Methane has 23 times the Global Warming Potential (GWP) of CO₂, while nitrous oxide has 296 times the GWP of CO₂. By improving livestock production efficiency, producers can both increase profits and reduce methane emissions. Methane can also be produced from microbial action in manure.

Greenhouse Gas Mitigation measures:

- Improve the productivity and efficiency of livestock production (thus lowering the methane emissions per unit of livestock) through improvements in nutrition and genetics;
- Supplement livestock diets with nutrients, as necessary (e.g. increasing the level of starch and rapidly fermentable carbohydrates, use of urea supplements). Production of feed supplements, may also, however, result in production of GHGs ;
- Increase the carbon to nitrogen ratio in feeds to reduce methane and nitrous oxide production;
- Implement balanced feeding (e.g. optimizing proteins and amino acids to correspond to requirements of particular animal groups);
- Consider various techniques to manage methane emissions from manure including controlled anaerobic digestion (to produce biogas), flaring / burning, use of biofilters, composting, and aerobic treatment. Use of anaerobic digestion may also reduce emissions of nitrous oxide;
- Minimize the amount of manure production through the implementation of animal waste management approaches;
- Control the temperature, humidity, and other environmental factors of manure storage to reduce methane and nitrous oxide emissions. This may involve use of closed storage tanks or maintaining the integrity of the crust on open manure storage ponds / lagoons.
- Implement pasture / grazing management techniques to reduce nitrous oxide and methane emissions, including not overstocking pastures, avoiding late fall and winter grazing, improving soil drainage, and avoiding soil compaction from grazing to maintain the anaerobicity of the soil.

Impact of Dust

Dust can reduce visibility, cause respiratory problems, and facilitate the transport of odours and diseases.

Dust Mitigation measure

Install dust-collection systems at dusty operations, such as feed grinding;

Prevent overgrazing of pasture land;

Implement fugitive-dust-control measures, such as wetting frequently travelled dirt roads, as necessary.

6.2 Hazardous Waste

Hazardous materials are used throughout the beef, milk, and pork production cycles (e.g. disinfecting agents, antibiotic and hormonal products).

Impact of Hazardous chemical waste

The potential pollutants from pesticides and other chemical product include the active and inert ingredients, diluents, and persistent degradation products. This waste may enter groundwater and surface water in solution, in emulsion, or bound to soil particles. In some instances, impair the uses of surface waters and groundwater. Some pesticides are suspected or known to cause chronic or acute Potential exposures to pesticides include dermal contact and inhalation during their preparation and application as well as ingestion due to consumption of contaminated water. The effect of such impacts may be increased by climatic conditions, such as wind, which may increase the chance of unintended drift, or high temperatures.

Mitigation Measures

- Maintain structures to keep out pests (e.g. plug holes, seal gaps around doors and windows);
- Use mechanical controls (e.g. traps, barriers, light, and sound) to kill, relocate, or repel pests;
- Use predators to control pests. Protect natural enemies of pests by providing a favorable habitat (e.g. bushes for nesting sites and other indigenous vegetation) that can house pest predators;
- Use good housekeeping practices in barns and other facilities to limit food sources and habitat for pests;
- Improve drainage and reduce standing water to control mosquito populations;
- Consider covering manure piles with geotextiles (which allow water to enter the pile and maintain composting activity) to reduce fly populations;

- If pesticides are used, identify in the IPM plan the need for the pesticide and evaluate their effectiveness, as well ;
- Purchase and store no more pesticide than needed and rotate stock using a “first-in, first-out” principle so that pesticides do not become obsolete. Additionally, the use of obsolete pesticides should be avoided under all circumstances;
- A management plan that includes containment, storage and ultimate destruction measures of obsolete stocks should be prepared in accordance to guidelines by FAO and consistent with country commitments under the Stockholm, Rotterdam and Basel Conventions.
- Implement groundwater supply wellhead setbacks for pesticide application and storage;
- Maintain records of pesticide use and effectiveness

Impact of hazardous biological waste

This waste contains disease-agents such as bacteria, fungi, mites, and viruses transmitted from live animals, manure, animal carcasses, and parasites and ticks (zoonoses) which can easily be transmitted to human population. Use of antibiotics in feed or water may be ineffective for antibiotic-resistant microorganisms which might develop in the gastrointestinal tract of animals. Resistant bacteria can potentially infect humans on or near the farm. The genetic material (DNA) can be taken up by other bacterial human pathogens.

Mitigating measures

Storage: this shouldn't be stored for long it should be disposed immediately. Other interventions are presented in the schematic diagram in figure 6.1 below.

Disposal Incineration should be done immediately

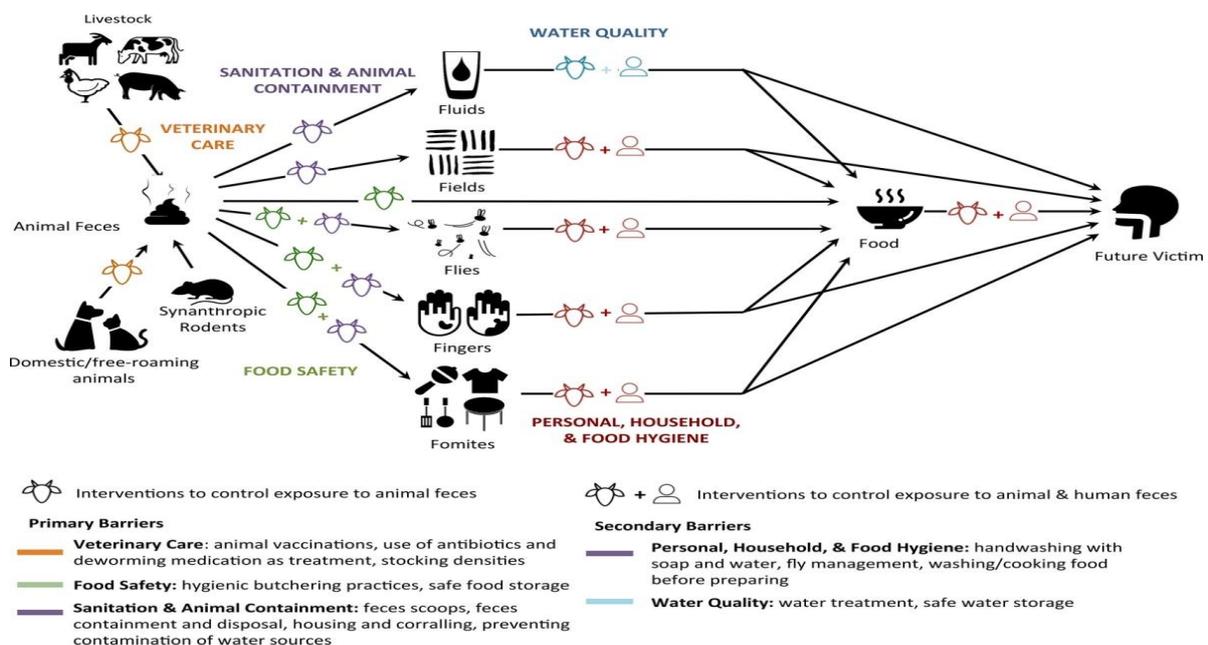


Figure 6. 1: F-diagram interventions that can block human exposure to animal faeces. Adapted from Wagner, E.; Lanoix, J.,

CHAPTER SEVEN: LIVESTOCK WASTE MANAGEMENT PLAN

The Livestock Waste Management Plan is predicated on International best practices and the waste management hierarchy. It encompasses a range of measures across all 5 tiers namely, prevention and minimisation, reuse, recycling, recovery and disposal towards minimization of waste impact on our environment.

7.1 Waste Hierarchy

As far as is reasonably practicable, general waste management and waste minimization will be practiced through the following waste hierarchy approach presented in figure 7.1

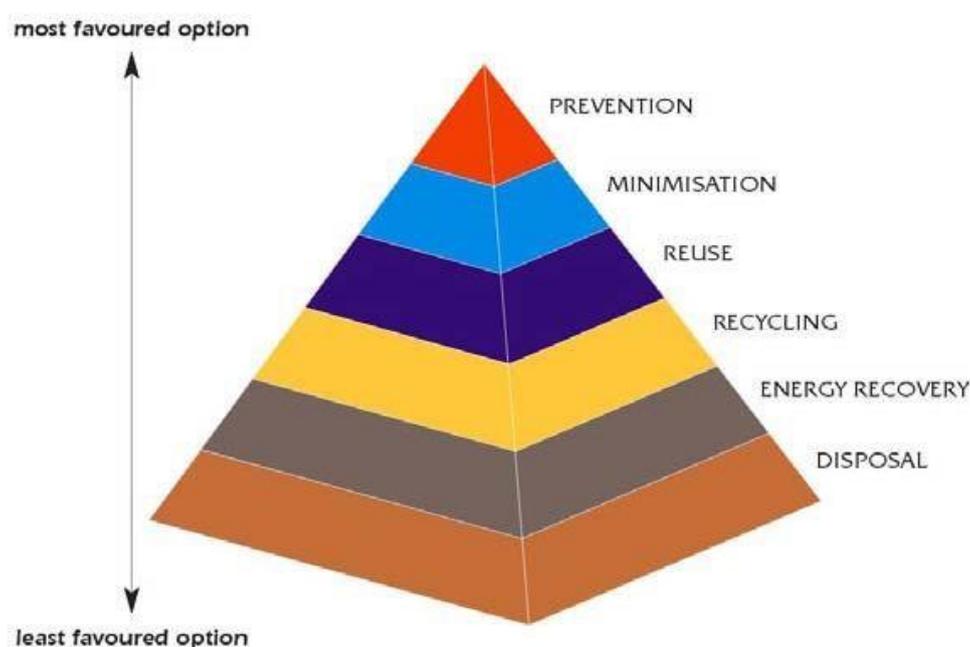


Figure 7. 1: Hierarchy of Waste

Prevention: Waste prevention at source. Departments must plan activities to avoid the generation of waste.

Minimization: Reduce the amount of waste produced.

Re-use: Re-use materials wherever possible.

Recycle: Transfer waste to approved recycling plants to minimize environmental impact.

Energy recovery: feasible to be carried out as farm waste because of high calorific value.

Disposal: Sending of waste to landfill as a last resort.

Hazardous waste will be disposed of and treated by authorized disposal contractors and facilities.

7.2 Waste Categories

Based on the activities that are undertaken within livestock farm, waste has been categorized into the following:

- Non-hazardous waste: includes paper, wood, office, rubbish, cardboard, scrap metal, and glass;
- Hazardous waste: animal waste, oil, lubricants cans, chemical, pesticides cans, paint cans, expired drugs etc.

7.3 General Waste Management Options Avoidance

In order to avoid the generation of waste each farm will where possible;

- Estimate and order the required quantities of supplies;
- Establish a Buy Back Scheme with key suppliers that is where ever such an option exists the supplier will take back the packing material. This is a requirement under the Extended Producer Responsibility (EPR) regulations for the food and beverage, Hides and Skin, and the chemical sectors at the national level in Nigeria. (See NESREA Regulations);
- Avoid the use of disposable materials.

Waste Reduction

In order to ensure reduction in waste generation, the following control measures will be introduced:

- Where reasonably practicable, materials shall be ordered in bulk to reduce packaging. Avoid individual packaging for volume purchases ;
- Where possible and practicable the use of returnable containers and packing materials will be favoured ;
- Purchase criteria will favour recycled products where applicable ;
- Suppliers will be requested to use minimal packaging ;
- Where possible and applicable, refillable containers will be used for the collection of waste fluids ;
- Ensure the correct amounts of chemicals are used when mixing or diluting chemicals to prevent avoidable waste generation.

Re-Use

The following control measures will be implemented to ensure reuse of generated waste:

- Evaluation of waste production processes and identification of potentially reusable /recyclable materials
- Identification and reuse/ recycling of products that can be reintroduced into the manufacturing process or industry activity at the site e.g
 - Where possible, paper will be re-used such as the printing of documents on the clear side of used documents.
 - Reuse the water for cleaning milk equipment or to clean the milking parlor.
 - Reuse materials that may be separated from pretreatment processes (e.g. screened materials, suspended solids, and emulsified fats from flotation) in the manufacture of high-quality by-products (e.g. pet food or technical fat for oleo chemicals manufacturing);
- Increase the quality of the sludge for possible use as agricultural fertilizer by reducing or eliminating pathogens such as E. coli 0157, campylobacter, and salmonella through controlled aerobic treatment (compost) or anaerobic digestion (bio-gas);
- Treat materials with high organic content (e.g. blood, fat, and manure) anaerobically for the purpose of generating and using bio-gas as an energy source.

General Waste Management Control Measures

The following control measures will be employed within each farm to reduce the environmental impacts from waste generation, handling, storage and disposal:

- Open burning of waste, dumping of waste in any water body (stream/ river / marine) or the dumping of waste at undesignated area within the property is prohibited ;
- Separate labelled waste receptacles will be provided for, plastic, cardboard / paper, tins, glass, the biodegradables/ manure, sharps etc. ;
- The dilution of hazardous waste is prohibited ;
- The mixing of hazardous and non-hazardous waste is prohibited ;
- All hazardous waste will be provided with secondary containment and suitably banded to meet legal requirements, where necessary ;
- A program for regular collection and removal of skips and bins will be implemented
- All litter will be controlled within each farm by means of good housekeeping ;
- Where possible, performance measurement and targets for reduction reuse and recycling will be developed and implemented ;
- Any wastes that cannot be reused and recycled will be transported and disposed in accordance with Municipality and environmental requirements ;
- Volumes and types of waste will be monitored to establish whether additional opportunities for improvements in waste management (avoid, reduce, reuse, recycle) can be adopted, where practicable ;
- All workers/ farm staff will be trained on the Waste Management Plan, through shift briefs, etc.

Disposal Landfill

Where the above hierarchy of control cannot be satisfied the waste will be sent to an approved Municipality landfill. Landfill is a last resort. The burning, burying, and unauthorized dumping of waste is prohibited.

7.3 Specific Waste Management Options

Specific waste management plan is summarised in table 7.1 for the production and processing value chain of the mammalian ruminants (cattle, sheep and goat), Small ruminants, Poultry & Birds, and Snails.

7.4. Screening checklist for future monitoring of projects

Projects, be they large or small, have the potential to adversely impact the environment, and depending on their location, can be vulnerable to natural hazard impacts. A simple questionnaire to guide decision making on the waste management issues that can arise from the LPRES project is stated below:

- Is there a plan to compost, recycle, reuse and reduce and/or properly dispose of wastes generated? Yes Unknown No N/A ;
- Will the project generate sewage and/or include a wastewater treatment solution? Yes Unknown No N/A;
- Will construction and/or operation of the project cause significant changes to the receiving environment's water resources and/or area drainage patterns (on-site or off-site, short term or long term)? Yes Unknown No N/A;
- Will the project involve the build-up or accumulation of waste from project activities? Yes Unknown No N/A ;
- Will the project involve the use of hazardous materials e.g. chemicals, vaccines, pesticides, poisonous gases? Yes Unknown No N/A ;
- Will the facility operation generate special waste streams that require special handling (e.g. biomedical waste, veterinary waste, waste oils)? Yes Unknown No NA
- Will the project be located in a polluted or contaminated area or close to a waste dump site? Yes Unknown No N/A ;
- Is the proposed site within the catchment area for regular collection and disposal of municipal solid waste? Yes Unknown No N/A

A screening checklist as indicated in table 7.2. for monitoring the project as regards waste management has been developed to provide guidance to farm operators and project staff and consultants in key phases of the livestock project cycle particularly monitoring, supervision and reporting. The objective of the checklist is meant to ensure that prospective developers:

- Adopt appropriate mitigation measures to safeguard the environment with respect to arising operational waste;

- Comply with provisions of relevant laws/ regulations/standards ;
Adopt eco-friendly practices to optimize use of resource.

Applicable Permits

Livestock rearing including cattle, goat and sheep (up to 20 cattle heads, 50 goat heads and 50 sheep heads 100 or more) warrant a Preliminary Environmental Report Approval or an EIA dependent on the scale of operations. It requires a Building and Land Use Permit (as applicable) and a Trade Permit. Livestock rearing has to be carried out in accordance with the provisions under the applicable Planning Policy.

Minimum requirement for location and siting include amongst others:

- The site shall be located at least 200 m away from settlement boundaries, sensitive land uses (schools, dispensaries, hospitals) any domestic borehole and slaughter house ;
- The site shall be located in agricultural land and outside irrigation zones ;
- Livestock farms should not be located within any Environmentally Sensitive Area (ESA) and its prescribed buffer zone such as wetland, steep slope and in areas that are likely to be affected by hazards such as inland flooding, landslide and storm surges, amongst others ; w
- On site wastewater disposal facility such as septic tanks and absorption pits/leaching fields should be located not less than 30 m from any water course ;
- Existing natural drains and watercourses should not be tampered with on or in the vicinity of the site.

Eco-friendly measures and sustainability

There is need to adopt eco-friendly practices to minimise use of resources. Such practices include among others rain water harvesting for cleaning, washing purposes as well as irrigation of grazing land, solar PV for lighting and use of eco-friendly detergents Other measures to ensure sustainability are noted below.

- The design of sheds, the stock density and vaccination to be as per the recommendations of the Ministry of Agriculture – livestock’s department.
- All issues pertaining to bio-security risks should be to the satisfaction of the Veterinary Services of the Ministry of Agriculture ;
- Any unusual deaths and/or disease outbreaks should be immediately reported to the Veterinary Services of the Ministry of Agriculture ;
- No slaughtering activities should be undertaken on site ;
Relevant organizations need to be consulted including the Livestock Services of the Ministry of Agriculture with respect to any Land Conversion Permit.

Table 7.1 below presents the Specific Waste Management Plan in the Value Chain of Livestock..

Table 7.1 below presents the Specific Waste Management Plan in the Value Chain of Livestock.

Table 7. 1: Specific Waste Management Plan in the Value Chain of Livestock

Type of Animal	Waste Generated	Source	Mitigation Measures	Implementation Schedule	Frequency	Institutional Responsibility for Implementation	Institutional Responsibility for Supervision	Annual Budget (Naira)
PRODUCTION PHASE								
SNAIL	Feed Waste	Leaves, flowers, fruits, tubers (cocoyam, yam, cassava etc.) peels of fruits and tubers.	Regulated quantity of feed should always be served. Snails are mostly herbivorous (feeding on plants) Waste feed should be mixed with other organic waste materials for compost manure / disposed with household waste.	On need basis during production process	Every 2 days	Pen cleaners, Farm management	FMENv	120,000
	Animal waste	Snail droppings	The soil in the cage, should be changed regularly and used as manure	On a need basis	Every 3month	Pen cleaners	FMENv	120,000
	Veterinary waste	Expired drugs and gloves,	Drugs should be purchased on order and a reusable glove	On a need basis	Monthly	Farm management	FMENv	120,000
	Waste Water	Water from washing the snails.	Reduce water consumption especially where it may be limited natural resources. Water can be reused to rinse/wash farm equipment	Regularly	Once in 2 weeks	Pen cleaners	FMENv	120,000
	Carcasses	Dead snails	Harvest mature snails to prevent congestion in cage or pen. Collect carcasses on a regular basis to prevent putrefaction	Daily	Everyday	Pen Cleaners, Farm management	FMENv and FMAgric	600,000
PROCESSING PHASE								
	Waste Generated	Source	Mitigation Measures	Implementation Schedule	Frequency	Institutional Responsibility for Implementation	Institutional Responsibility for Supervision	Budget
	Animal waste	shells, intestines, body fluid, heart,	Farm management should sell Snail shells to be used as an adsorbent for	On a need basis during	Everyday	Pen Cleaners, Farm management	FMENv and FMAgric	120,000

		stomach, kidney, liver, intestine and the head	waste water treatment from beverage industries. The shell can serve as feed for pigs, it can also be crushed in powder form and serve as a supplement for grass cutter, poultry and fish feed The intestinal tract, liver, kidney should be properly disposed in a landfill or mixed with materials for organic manure.	processing phase				
	Waste water	Water for washing, rinsing and, boiling snails.	Snail washing should be with potassium, lime or lemon (CAN BE DISPOSED WITH OTHER HOUSEHOLD WASTE) to reduce water consumption and the wastewater should be collected in a septic tank.	Regularly	Regularly	Farm management	FMENv	120,000
	Packaging waste	Nylon, plastics, cartons etc.	The Packaging materials should be received back for recycling under the Extended Producer Responsibility Policy	Regularly	Regularly	Farm management	FMENv, NESREA	180,000
		TOTAL BUDGET FOR SNAIL: 1,500,000.00						
Grass cutter	PRODUCTION PHASE							
	Waste Generated	Source	Mitigation Measures	Implementation Schedule	Frequency	Institutional Responsibility for Implementation	Institutional Responsibility for Supervision	Budget
	Feed waste	Green forage, bamboo shoot, wheat barn, ripe and unripe fruits etc.	Regulated quantity of feed should always be served to avoid rotten organic feed. Rotten feed waste can be converted to organic manure. Efficient storage, handling and use of feed by observe their best feed.	Regularly	Every 3days	Pen cleaners	FMENv	120,000
	Animal dung	Animal feces	Disposal in government approve landfill or used as manure.	Regularly	Every 3days	Pen cleaners	FMENv	120,000

	Waste water	Waster used for cleaning the pen, equipment used in the pen.	Waste water treatment plant for the reused of water. Reduce water consumption especially where it may be limited natural resources.	Regularly	Daily	Pen cleaners, Farm Maintenance Team	FMENv	120,000
	Veterinary waste	Expired drugs, vaccines, Used needle.	Purchase of drugs and vaccine is small quantity Regular Collection of waste in a separated labelled bin. Proper disposal through incineration or landfill	On a need basis		Farm management Veterinary officer	FMENv	120,000
	Carcasses	Dead Glasscutters, Dead Rodents	proper animal care and disease prevention; Collect carcasses on a regular basis to prevent putrefaction; Compost only disease-free carcasses and ensure that the composting process is managed to prevent leachate and odors Diseased carcasses should be incinerated	On regular basis	Daily	Farm personnel, Pen Cleaner	FMAgric, FMENv	600,000
PROCESSING PHASE								
	Waste Generated	Source	Mitigation Measures	Implementation Schedule	Frequency	Institutional Responsibility for Implementation	Institutional Responsibility for Supervision	Budget
	Animal waste	Blood, Intestinal tract, fur, claws	Processed and used as feed for fish feeds and poultry birds. They can be mixed with other materials used for organic manure. Proper disposal in landfill or incineration	On regular basis during processing phase	Daily	Process section personnel	FMENV	240,000
	Waste water	Water from cleaning, washing and rinsing.	Effluent Treatment Plant for water reuse and conservation.	Regularly during	Daily	Plant Engineer	FMENv	120,000

			Sanitary waste water should be channeled to a septic tank.	processing phase				
	Packaging	Nylon, plastic containers, cartons	The Packaging materials should be received back for recycling under the Extended Producer Responsibility Policy	Regularly	Daily	Farm management	FMENv, NESREA	180,000
	TOTAL BUDGET FOR GRASSCUTTER: 1,620,000.00							
Sheep	PRODUCTION PHASE							
	Waste Generated	Source	Mitigation Measures	Implementation Schedule	Frequency	Institutional Responsibility for Implementation	Institutional Responsibility for Supervision	Budget
	Feed Waste	Dry Grass, clover, forbs and hay	Regulated quantity of feed should always be served. Proper storage, handling of feed should be practiced.	Regularly	Every 3days	Farm Personnel	FMENv	600,000
	Dung	Animal feces	Dungs should be used as manure on farmland	Regularly	Daily	Farm Personnel	FMENv	360,000
	Dead Animal	Dead sheep, Dead Rodent	proper animal care and disease prevention; Collect carcasses on a regular basis to prevent putrefaction; Compost only disease-free carcasses and ensure that the composting process is managed to prevent leachate and odors. Regular veterinary check-up of animals.	On a need basis	Periodically	Farm Personnel, Veterinary officer	FMAgric, FMENv	600,000
	Wastewater	Housekeep and sanitary use	Direct runoff from cleaning animal house and spillage of drinking water into a Septic tank	Regularly	Every 3days	Farm Personnel	FMENv	360,000
	Hazardous and Veterinary Waste	Used Syringes, used needles, used drug packs, used vaccine bottles, expired drugs & vaccines	Purchase vaccines and drug on request to avoid stockpile of vaccines Designated waste bins with clearly marked label	On a need basis	Monthly	Farm management Veterinary officer	FMENv	600,000

			Proper disposal through incineration or landfill					
PROCESSING PHASE								
	Waste Generated	Source	Mitigation Measures	Implementation Schedule	Frequency	Institutional Responsibility for Implementation	Institutional Responsibility for Supervision	Budget
	Animal waste	Inedible organs, animal hair, animal fats	Offal and other by- product are processed and used as pet food and rendered product. Fat are to be converted into tallow and used in other industries. They can be mixed with other materials used for organic manure.	On regular basis during processing phase	Daily	Process section personnel	FMENV	480,000
	Waste water	Water from cleaning, washing and rinsing.	Effluent Treatment Plant for water reuse and conservation. Sanitary waste water should be channeled to a septic tank.	Regularly during processing phase	Daily	Plant Engineer	FMENV	600,000
	Packaging	Nylon, plastic containers, cartons	The Packaging materials should be received back for recycling under the Extended Producer Responsibility Policy	Regularly	Daily	Farm management	FMENV, NESREA	240,000
	TOTAL BUDGET FOR SHEEP: 3,840,000.00							
PRODUCTION PHASE								
Goat	Waste Generated	Source	Mitigation Measures	Implementation Schedule	Frequency	Institutional Responsibility for Implementation	Institutional Responsibility for Supervision	Budget
	Feed Waste	Dry Grass, clover, forbs and hay	Regulated quantity of feed should always be served. Proper storage, handling of feed should be practiced.	Regularly	Every 3days	Farm Personnel	FMENV	840,000
	Dung	Animal feces	Dungs should be used as manure on farmland	Regularly	Daily	Farm Personnel	FMENV	360,000

	Dead Animal	Dead sheep, Dead Rodent	proper animal care and disease prevention; Collect carcasses on a regular basis to prevent putrefaction; Compost only disease-free carcasses and ensure that the composting process is managed to prevent leachate and odors. Regular veterinary check-up of animals.	On a need basis	Periodically	Farm Personnel, Veterinary officer	FMAgric, FMENv	600,000
	Wastewater		Direct runoff from cleaning animal house and spillage of drinking water into a Septic tank	Regularly	Every 3days	Farm Personnel	FMENv	480,000
	Hazardous and Veterinary Waste	Used Syringes, used needles, used drug packs, used vaccine bottles, expired drugs & vaccines	Purchase vaccines and drug on request to avoid stockpile of vaccines Designated waste bins with clearly marked label Proper disposal through incineration or landfill	On a need basis	Monthly	Farm management Veterinary officer	FMENv	600,000
PROCESSING PHASE								
	Waste Generated	Source	Mitigation Measures	Implementation Schedule	Frequency	Institutional Responsibility for Implementation	Institutional Responsibility for Supervision	Budget
	Animal waste	Inedible organs, animal hair, animal fats	Offal and other by- product are processed and used as pet food and rendered product. Fat are to be converted into tallow and used in other industries. They can be mixed with other materials used for organic manure.	On regular basis during processing phase	Daily	Process section personnel	FMENV	720,000
	Waste water	Water from cleaning, washing and rinsing.	Effluent Treatment Plant for water reuse and conservation. Sanitary waste water should be channeled to a septic tank.	Regularly during processing phase	Daily	Plant Engineer	FMENv	600,000

	Packaging	Nylon, plastic containers, cartons	The Packaging materials should be received back for recycling under the Extended Producer Responsibility Policy	Regularly	Daily	Farm management	FMENv, NESREA	240,000
	TOTAL BUDGET FOR GOAT: 4,440,000.00							
Cattle	PRODUCTION PHASE							
	Waste Generated	Source	Mitigation Measures	Implementation Schedule	Frequency	Institutional Responsibility for Implementation	Institutional Responsibility for Supervision	Budget
	Feed Waste	Dry Grass, clover, forbs and hay	Regulated quantity of feed should always be served. Proper storage, handling of feed should be practiced.	Regularly	Every 3days	Farm Personnel	FMENv	900,000
	Dung	Animal feces	Dungs should be used as manure on farmland	Regularly	Daily	Farm Personnel	FMENv	480,000
	Dead Animal	Dead cattle, Dead Rodent	proper animal care and disease prevention; Collect carcasses on a regular basis to prevent putrefaction; Compost only disease-free carcasses and ensure that the composting process is managed to prevent leachate and odors. Regular veterinary check-up of animals.	On a need basis	Periodically	Farm Personnel, Veterinary officer	FMAgric, FMENv	840,000
	Wastewater	Water from cleaning, washing and rinsing.	Direct runoff from cleaning animal house and spillage of drinking water into a Septic tank	Regularly	Every 3days	Farm Personnel	FMENv	480,000
	Hazardous and Veterinary Waste	Used Syringes, used needles, used drug packs, used vaccine bottles, disinfecting agents, pesticides, antibiotic and hormonal products	Purchase vaccines and drug on request to avoid stockpile of vaccines Designated waste bins with clearly marked label Proper disposal through incineration or landfill	On a need basis	Monthly	Farm management Veterinary officer	FMENv	600,000

		and others expired drugs & vaccines						
	PROCESSING PHASE							
	Waste Generated	Source	Mitigation Measures	Implementation Schedule	Frequency	Institutional Responsibility for Implementation	Institutional Responsibility for Supervision	Budget
	Animal waste	Inedible organs, animal hair, animal fats	Offal and other by- product are processed and used as pet food and rendered product. Fat are to be converted into tallow and used in other industries. They can be mixed with other materials used for organic manure.	On regular basis during processing phase	Daily	Process section personnel	FMENV	70,000
	Waste water	Processing water for washing of meat processed	Effluent Treatment Plant for water reuse and conservation. Sanitary waste water should be channeled to a septic tank.	Regularly during processing phase	Daily	Plant Engineer	FMENV	50,000
	Packaging	Nylon, plastic containers, cartons	The Packaging materials should be received back for recycling under the Extended Producer Responsibility Policy	Regularly	Daily	Farm management	FMENV, NESREA	200,000
	TOTAL BUDGET FOR CATTLE: 3,620,000.00							
Pig	PRODUCTION PHASE							
	Waste Generated	Source	Mitigation Measures	Implementation Schedule	Frequency	Institutional Responsibility for Implementation	Institutional Responsibility for Supervision	Budget
	Feed Waste	Soybeans, corn, fruits, leaves, waste organic food, pelletized feed	Regulated quantity of feed should always be served. Proper storage, handling of feed should be practiced Proper feed bin management	Regularly	Every 3days	Farm Personnel	FMENV, NESREA	840,000
	Dung	Animal feces	Processed and converted to manure	Regularly	Daily	Farm Personnel	FMENV, NESREA	360,000

Dead Animal	Dead pig	Avoid garbage feeds, Proper animal care and disease prevention; Collect carcasses on a regular basis to prevent putrefaction; Compost only disease-free carcasses and ensure that the composting process is managed to prevent leachate and odors. Regular veterinary check-up of animals.	On a need basis	Periodically	Farm Personnel, Veterinary officer	FMAgric, FMENv	600,000
Wastewater	Cleaning of pen, equipment and sanitary	Direct runoff from cleaning animal house and spillage of drinking water into a Septic tank	Regularly	Every 3days	Farm Personnel	FMENv	480,000
Hazardous and Veterinary Waste	Used Syringes, used needles, used drug packs, used vaccine bottles, disinfecting agents, pesticides, antibiotic and hormonal products and others expired drugs & vaccines	Purchase vaccines and drug on request to avoid stockpile of vaccines Designated waste bins with clearly marked label Proper disposal through incineration or landfill	On a need basis	Monthly	Farm management Veterinary officer	FMENv	600,000
PROCESSING PHASE							
Waste Generated	Source	Mitigation Measures	Implementation Schedule	Frequency	Institutional Responsibility for Implementation	Institutional Responsibility for Supervision	Budget
Animal waste	Inedible organs, animal fats, dungs	Offal and other by- product are processed and used as pet food and rendered product. Fat are to be converted into tallow and used in other industries. They can be mixed with other materials used for organic manure.	On regular basis during processing phase	Daily	Process section personnel	FMENv	600,000

	Waste water	Blood, wastewater from dressing, washing and rinsing of the processed pork	Effluent Treatment Plant for water reuse and conservation. Sanitary waste water should be channeled to a septic tank.	Regularly during processing phase	Daily	Plant Engineer	FMENv	600,000
	Packaging	Nylon, plastic containers, cartons	The Packaging materials should be received back for recycling under the Extended Producer Responsibility Policy	Regularly	Daily	Farm management	FMENv, NESREA	200,000
	TOTAL BUDGET FOR PIG: 4,280,000.00							
Poultry	PRODUCTION PHASE							
	Waste Generated	Source	Mitigation Measures	Implementation Schedule	Frequency	Institutional Responsibility for Implementation	Institutional Responsibility for Supervision	Budget
	Solid Waste components - Feed waste	Perforated feed bag, spilled during storage, loading, and unloading or during animal feeding	Regulated quantity of feed should always be served. Appropriate feed-holder should be strictly adopted; Proper storage, handling of feed should be practiced.	Regularly	Daily	Farm Personnel	FMENv/ NESREA/ State Min of Environment	90,000
	Bird Excretes	Droppings	Processed into compost and as well processed into feed for fishes.	On a need basis	Every 3days	Farm Personnel	FMENv	480,000
	Dead Birds	Disease, Flu, poor housekeep.	Proper animal care and disease prevention; Collect carcasses on a regular basis to prevent putrefaction; Compost only disease-free carcasses and ensure that the composting process is managed to prevent leachate and odors. Regular veterinary check-up of animals.	On a need basis	Frequently	Farm Personnel and Veterinary officer	FMAgric /State Min of Agric, FMENv/ NESREA	840,000
	Veterinary waste	Used Syringes, used needles, used drug packs, used vaccine	Purchase vaccines and drug on request to avoid stockpile of vaccines	On a need basis	Monthly	Farm Personnel and	FMENv	600,000

		bottles, expired drugs & vaccines	Designated waste bins with clearly marked label Proper disposal through incineration or landfill			Veterinary officer		
	Hatchery Waste	Infertile hatching eggs, Methylbromide, Ethylene, egg shells, dead embryos, weaklings and packaging materials	Check hatcher temperature and relative humidity. Usage of Fresh feeds and addition of Vitamin E supplements to water Off-site rendering as mortality is recycled into protein by-product for animal feed	Regularly	Daily	Poultry Farm Manager	FMEnv	600,000
	Gaseous emission	Air emissions from poultry production include primarily ammonia (e.g. management of animal waste), odors (e.g. animal housing and waste management), and dust (e.g. feed storage, loading and unloading, and waste management activities).	<ul style="list-style-type: none"> •Control the temperature, humidity, and other environmental factors of manure storage to reduce emissions; •Consider composting of manure to reduce odor emissions; •Reduce emissions and odors during land application activities by applying a few centimeters below the soil surface and by selecting favourable weather conditions (e.g. wind blowing away from inhabited areas); •If necessary, apply chemicals (e.g. urinase inhibitors) to reduce conversion of nitrogen to ammonia •Install dust collection systems (including use of misters) in areas with dusty operations (e.g. feed grinding); •Implement fugitive dust-control measures (e.g. wetting vehicle parking lots and frequently travelled dirt roads, as necessary); •Ensure the prevention of bioaerosols emissions, which may contain disease-causing agents, through the application of the above-reference dust and 	Regularly	Weekly	Farm Personnel and Poultry Farm Manager	FMEnv/ NESREA and State Min. of Environment	840,000.00

			emissions control measures in manure production and storage facilities.					
Wastewater	Poultry operations may generate effluents from various sources including runoff from poultry housing, feeding, and watering; from waste storage and management facilities. Waste management activities such as land application of manure, may generated non-point source effluents due to runoff.	<ul style="list-style-type: none"> •Reduce water use and spills from animal watering by preventing overflow of watering devices and using calibrated, well-maintained self-watering devices; •Install vegetative filters to trap sediment; •Install surface water diversions to direct clean runoff around areas containing waste; •Implement buffer zones to surface water bodies, as appropriate to local conditions and requirements, and avoiding land spreading of manure within these area 	Regularly	weekly	HSE Farm Personnel and Poultry Farm Manager	FMEnv/ NESREA and State Min. of Environment	840,000.00	
PROCESSING PHASE								
Waste Generated	Source	Mitigation Measures	Implementation Schedule	Frequency	Institutional Responsibility for Implementation	Institutional Responsibility for Supervision	Budget	
Dressing waste,	Feathers, non-edible organs	Processed with heat to hydrolyze the proteins for animal feed; Converting to manure or incinerate	On regular basis during processing phase	Daily	Process section personnel	FMENV, FMAgric	600,000	
Wastewater from processing	Slaughtering process i.e. Blood flows, during cleaning of bird cages and sanitary use	Use of dripping trays to collect blood and ensure that it is transported to the blood tank rather than into the waste water stream Installation of Effluent Treatment Plant for water reuse and conservation.	On regular basis during processing phase	Daily	Process section personnel	FMENV	600,000	

			Sanitary waste water should be channeled to a septic tank.					
	Packaging Materials	Plastics, Nylons, cartons, crates etc.	Based on the Extended Producer Responsibility (EPR) principle, the producer should bear the responsibility of taking back, recycling and final disposal of the packaging materials.	Regularly	Daily	Farm Management	FMENV, NESREA	240,000
		TOTAL BUDGET FOR POULTRY: 5,730,000.00						
		TOTAL BUDGET FOR WMP FOR LIVESTOCK'S: 25,030,000.00						

Table 7. 2: Screening Checklist for Future Monitoring of the Project

Type of waste	Source	Best Mitigation Practices	Site specific Conditions
HAZARDOUS WASTE			
Waste water	Water from cleaning and disinfecting farm equipment's, water from feeding and watering and washing of livestock, rinsing carcasses and by products livestock product processing (milk, meat, chicken)	<p>Use floor drains and collection channels with grids, screens, and / or traps to reduce the amount of solids entering the wastewater stream</p> <p>Choose cleaning agents that do not have adverse impacts on the environment in general, on wastewater treatment</p> <p>reduce water consumption especially where it may be limited natural resources</p> <p>Reuse water used for cleaning equipment.</p> <p>Reduce water use and spills from animal watering by preventing overflow of watering devices and using calibrated, well-maintained self-watering devices;</p> <p>Install vegetative filters to trap sediment;</p> <p>Install grids to reduce or avoid the introduction of solid materials into the wastewater drainage system;</p> <p>Install surface water diversions to direct clean runoff around areas containing waste;</p> <p>Transport liquid effluent in sealed tankers</p>	located at least 200 m away from settlement boundaries, sensitive land uses (schools, dispensaries, hospitals) any domestic borehole and slaughter house.

Sediments and sludge		Reuse of high-quality, low risk by-products and suspended solids and emulsified fats from flotation that are separated during pre-treatment processes; Use of aerobic and anaerobic stabilization improves the sludge applicability for agricultural use. Pathogens present in the sludge can be destroyed during controlled anaerobic digestion (biogas) or aerobic treatment (composting); Preventing the mixing of wastes or other streams that contain metals and complexing agents.	Existing natural drains and watercourses should not be tampered with on or in the vicinity of the site
Carcasses	Dead animals collected in farm	proper animal care and disease prevention; Collect carcasses on a regular basis to prevent putrefaction; Compost only disease-free carcasses and ensure that the composting process is managed to prevent leachate and odours;	located not less than 30 m from any water course.
Veterinary waste	Expired drugs, vaccines, syringes and other veterinary sharps.	Purchase of drugs and vaccine in small quantity Regular Collection of waste in a separated labelled bin. Proper disposal through incineration or landfill	
Chemical waste	Pesticides, disinfecting agents, antibiotic and hormonal products	Use good housekeeping practices in barns and other facilities to limit food sources and habitat for pests Improve drainage and reduce standing water around the farm Mixing and transfer of pesticides should be undertaken by trained personnel in ventilated and well-lit areas Used pesticide containers should not be used for any other purpose	
Non-Hazardous Waste			
Animal waste	Cow dungs and poultry droppings (manure), waste from processing.	Use quality, uncontaminated feed materials Keep manure as dry as possible Use low-phosphorus diets with highly digestible inorganic phosphates; Grind feed to increase utilization efficiency by the animals thereby reducing the amount of manure generated prevent manure contamination of surface water and ground water by using concrete floor for storage facilities covering manure storage areas with a fixed roof or plastic sheeting bones, trim, scraps, hooves, horns and other detritus (not otherwise used beneficially for the production of stable meals, for example, bone meal) Avoid processing of waste materials for same species feeding	Existing natural drains and watercourses should not be tampered with on or in the vicinity of the site

Waste feed	Hay, grains, silage and other feed supplement (protein, amino acids, heavy metals e.tc)	Use covered or protected feeders to prevent prevent spills and feed contact with the ground waste feed should be mixed with other recyclable materials to be used for fertilizer efficient storage, handling and use of feed by maintaining records of feed purchases and livestock feed use	
------------	---	--	--

CHAPTER EIGHT: INSTITUTIONAL ARRANGEMENT

The successful implementation of the WMP will depend on the commitment of the LPRES Project Management Unit (PMU) and other supporting institutions relevant to delivering essential environmental, social, and waste management functions. In addition, the capacity within the institutions to apply or use the plan effectively, and the appropriate and functional institutional arrangements, among others will go a long way to ensure the adherence to the framework. The key WMP areas relevant to its successful implementation:

- Process Cycle ;
- Waste Management Plan Monitoring;
- Training and Infrastructural Capacity Strengthening;
- Budgets for the WMP;
- Institutional Arrangements.

8.1 Project Cycle

The WMP has categorised the LPRES Project cycle or process into four phases of work cycle:

- *Project Planning and Design*: The planning and design phases involves:
 - The overall planning and design of the project, consultation with the land owners/community and identification of likely Project Affected Persons, Pest management and Waste management issues are identified. At this stage, safeguard instruments such as the ESMPs, RAPs/ARAPs, IPM, WMP are prepared and disclosed.
- *Livestock Farm and Facilities Preparation & Project Implementation Stage*: The stage involves where actual rehabilitation or construction activities begin. At this stage, the main focus will be on Health & Safety of members of the public and onsite workers on farms and processing facilities. Consequently, monitoring plays the important role in this stage to ensure all measures are followed as per the contract document for supported farms and facilities.
- *Project Operation Stage*: At this stage, crucial activities will include animal and veterinary waste disposal and management, storage of material, safe work practises that will ensure no harm or injury to people and no damage to the environment.
- *Project Decommissioning & Demobilisation*: This stage involves activities such as the demobilization of site involving removal of machinery & equipment deployed for the livestock farms operation.

8.2 Waste Management Monitoring Plan

The efficient monitoring of this WMP shall comprise the ensuring effective compliance for the entire life cycle of this project from planning through the construction, operational and

decommissioning phases. This shall be guaranteed by pursuing the proper implementation of the Waste Management monitoring plan in Table 8.1 below.

Table 8. 1: Livestock’s Waste Management Monitoring Plan

ISSUE	METHOD OF MONITORING	AREAS OF CONCERN	POSITIVE INDICATOR (VALUES)	FREQUENCY	RESPONSIBLE AUTHORITIES
Air Pollution	<p>Observations should be made on the level of dust, ammonia, methane, greenhouse gas and odors generated during the livestock production on site.</p> <p>Using gas sensors in milking parlors and cow and poultry sheds</p> <p>Dampening and use of urinase chemicals should be carried out if levels are unacceptable.</p>	<p>Levels of bioaerosols, and dust emissions from (e.g. feed storage, loading, and unloading, feeding, and waste management,</p> <p>Level of ammonia from management of animal or poultry waste</p> <p>Level of methane, greenhouse gas, and nitrous oxide from (e.g. animal feeding and waste management),</p> <p>Explosive concentrations of methane may be released during liquid manure agitation and remain for several weeks after emptying the storages.</p> <p>Level of odors (Hydrogen sulfide) (e.g. animal housing and waste management-agitation of manure)</p>	<p>Deposition of dust on surfaces should decrease with increased dampening</p> <p>The minimum perceptible level for ammonia is 0.5 to 54 ppm</p> <p>Air mixtures containing from 50,000–150,000 ppm or 5–15% CH₄ are explosive.</p> <p>Typical concentrations of CO₂ in well-ventilated buildings are in the 500–5000 ppm</p> <p>Concentrations reaching 200–300 ppm have been reported within a few minutes after the start of manure agitation and have been as high as 1000 ppm during vigorous agitation.</p>	Daily / Regularly	<p>NESREA and State Ministry of Agric / Health</p> <p>Project PCU Environmental Specialist</p>
Water resources	Water resources should be monitored on site and downstream	Watercourses and impoundments.	Water sample to meet permissible limits prescribe by the NESREA regulation	Tests for water pollution to be done regularly – monthly	Project PCU Department of Water

	<p>through regular testing of water resources.</p> <p>Appropriate land use downstream is done and no pollution of crops from contaminated water from spillages occurs.</p>	<p>Surface water quality</p> <p>Ground Water Quality</p> <p>Recommended distances from watercourses.</p> <p>Possible lagoon/dam construction sites.</p>	<p>(See annex 1) and the respective state standards.</p> <p>Effluent treat plant installed. Techniques for treating process wastewater in this sector include:</p> <p>Sedimentation for suspended solids reduction using clarifiers or settling ponds;</p> <p>Flow and load equalization; biological treatment, typically anaerobic followed by aerobic treatment, for reduction of soluble organic matter (BOD); biological nutrient removal for reduction in nitrogen and phosphorus; chlorination of effluent when disinfection is required;</p> <p>Dewatering of residuals and composting or land application of wastewater treatment residuals of acceptable quality.</p> <p>Additional engineering controls may be required (i) if pass through of active ingredients (residual amounts of growth enhancers and antibiotics, among other hazardous constituents) is an issue, and (ii) to contain and neutralize nuisance odors.</p>		<p>NESREA/ State Environment Agency/ Ministry</p>
--	--	---	--	--	---

Complaints	The PCU should with respect to the record of complaints made by local residents, to be kept by the farmers, and should check that action is taken quickly and that the number of complaints do not rise significantly.	Complaints	Number and type of Complaints received, complaint responded to and resolved.	Regularly- quarterly	Project PCU Farm Manager
------------	--	------------	--	----------------------	--------------------------

8.2.1 Monitoring Components

The monitoring programme under the plan shall establish the details and fundamental essentials of the environmental and socioeconomic monitoring parameters of each component of the environment that will be affected by the proposed project. The components shall include:

A. Air Quality

Monitoring of air quality shall be carried out by a combination of Visual Observation and air monitoring using standard method of sampling and analysis around the premises for SPM, SO₂, CO, NO_x.CH₄

B. Noise

Noise levels shall be monitored using noise level measurement equipment, which shall ensure that acceptable noise level is lower than the OSHA (Occupational Safety and Health Standards) of 85 decibels.

C. Water

Water quality shall be monitored using standard methods of sampling and analysis on surface water around and downstream of the production and processing farms or facilities for pH, BOD₅, COD, Temperature Increase, Total Nitrogen, Total Phosphorus, Total Suspended solids, Total Coliform Bacteria, Active ingredients/ Antibiotics on a case by case basis.

D. Soil

Collection of soil sample and subsequent analyzing shall be carried out in the laboratory to monitor temperature, PH levels and levels of K, SO₂ and Calcium.

E. HSE and Waste management

Health shall be monitored by observation of frequency of work related illnesses or incidents, while Occupational Safety and health would be assessed by compliance with safety instructions and use of PPE. Waste management shall be monitored by implementation of the site waste management plan that each farm and applicable contractor will be required to submit.

8.2.2 Waste Management Monitoring Plan Schedules

Regular data collection, audits, inspections, and related monitoring activities will be required for each category at a pre-determined frequency, either based on the schedule established in the regulations for Regulatory Monitoring or based on the schedule established specifically for the proposed project. Subsequently, each monitoring programme will be guided by the established schedule, whereby monitoring may be performed daily, weekly, monthly, quarterly, or continuously, depending upon the resources, regulatory specifications for monitoring, and the project-specific requirements for monitoring programmes.

8.2.3 Monitoring Procedure

Each livestock production farm and processing facility shall develop an approach that will guide the analysis and review of monitoring data at regular intervals in a manner that will enable comparison with benchmarks and operational standards, where necessary. Monitoring should be conducted by trained individuals following best practice monitoring and record-keeping procedures and using properly calibrated and maintained equipment.

8.2.4 Emergency Contingency Planning Requirements

This contingency plan shall be according to the World Bank Safeguards Policy. Hence, in pursuance of the implementation of best practise environmental and social measures, Livestock Farms and Facilities Personnel and applicable contractors shall be mandated to promptly incorporate, all the necessary HSE compliant measures, into the livestock production and processing activities, with the aim of preventing the release of harmful Green House Gas emissions or products, hazards, while incidents, near misses and accidents events are minimized, if not completely eliminated. For effectiveness, these contingency plans shall cover all project facilities and ancillary services.

8.2.5 WMP Monitoring Responsibilities

The overall responsibility of ensuring the implementation, administration and enforcement of the Waste Management Plan shall be that of the Project Management Unit, through the Environmental specialist or any personnel so appointed within the monitoring team.

The monitoring roles and responsibilities would be as follows:

- a) Sampling, analysis and evaluation of monitoring parameters with reference to the Waste Management Plan recommendations and requirements;
- b) Carry out environmental site surveillance to investigate and audit the Farm, Facilities and Contractors' site practices as applicable, equipment and work methodologies with respect to pollution control and adequacy of waste management mitigation measures implemented;
- c) Review the success of WMP programme to cost-effectively confirm the adequacy of mitigation measures implemented
- d) Monitor compliance with environmental protection, pollution prevention and control and contractual requirements;
- e) Monitor the implementation of other environmental mitigation measures;
- f) Audit and prepare audit reports on waste management compliance, the environmental monitoring data and site environmental conditions;
- g) Compliance investigation, evaluation and identification of corrective measures;
- h) Offer advice to the Contractor(s) on environment improvement, awareness, and proactive pollution prevention measures, including best practise on site measures to prevent spread of zoonotic diseases and communicable diseases such as the deadly Ebola virus disease.
- i) Follow the procedures in the WMP and recommend suitable mitigation measures to the Contractor(s) in the case of non-compliance / discrepancies identified.
- j) Perform interface functions by liaising with the Contractor(s) and LPRES on all environmental performance matters, and timely submission of reports to the project proponent and relevant administrative authorities, where necessary.

8.3 Environmental Auditing

To promote compliance with the environmental and social issues identified in this WMP, an auditing of the project sites shall be carried out on every quarter during the construction phase; and annually when the project gets into operation phase or as required directed by the PIU. The objectives of these Waste Management auditing shall include the following;

- Ensuring compliance with Waste Management Plan;
- Recommending areas of improvements in the current WMP;
- Updating database of environmental and social issues encountered on the project.

The audit will include community liaison activities to review the social aspects of the project and highlight areas in which there may be need for support.

8.4 Incident Reporting

The farm manager and project contractor as applicable will be required to document environmental incidents such as spills, pollution incidents and near misses with a copy forwarded to the PIU environmental specialist and any other regulators, as may be directed.

Table 8.2. Shows the monitoring components for this project and corresponding costs.

Table 8. 2: Summary of Monitoring Plan and Cost

Component	Monitoring Parameter/Action	Method	Frequency	Responsible	Annual Budget (₦)
Air quality	SPM, SO ₂ , CO, NO _x	Visual Observation and <i>purchase</i> of equipment for, air monitoring using standard method of sampling and analysis around the premises	Ensure testing Once a week (night and day each time)	Environmental specialist/M&E unit	600,000
Noise	55dB	Noise measurement equipment	Same as above	Environmental specialist/M&E unit	
Water	NO ₃ , pH, BOD,	Collection of downstream surface and site ground water samples and analyzing in the laboratory	Monthly / quarterly Monitoring	Environmental specialist/M&E unit	
Soil	K, SO ₂ , pH, Ca, Temperature, BOD	Collection of soil sample and analyzing in the laboratory	Quarterly	Environmental specialist/M&E unit	
Health, Safety & Environment (HSE)	Safety audit Health assessment	Regular visit to site	Bi-monthly	Contractor HSE officer/ Environmental Specialist/M&E officers	300,000
Waste Management	Ensure campaigns are carried out as scheduled	Regular visit to site	Monthly	M&E officers	
Health and Sanitation	Flood, Water logging of surfaces, prevention of stagnant water	Visual assessment by regular visits to site	Routinely during construction	project monitoring and evaluation team	
Total Monitoring Cost			900,000.00		

8.5 Capacity Building and Training Plan

The implementation of this WMP shall require that personnel and stakeholders possess the appropriate capacity in knowledge skills and necessary structural infrastructures to deliver effective waste management. This capacity building plan has taken this into consideration in Table 8.3 and 8.4 respectively as follows:

Table 8. 3: Budgets for Capacity Building and Training Plan

S/N	Proposed Training Topics	Course Content	Target audience	Duration	Cost
1	Training on environmental health and safety guidelines for livestock production including world bank safeguard policies.	<ul style="list-style-type: none"> • What is meant by EHS guidelines • How can this guideline help and improve the environment, human health and livestock production? 	Farm owners, farm management, veterinarian officers, animal pen attendant.	Two days	620,000
	Occupational health and safety	<ul style="list-style-type: none"> • How to mitigate occupational and health hazards (accident, zoonotic diseases and other kinds of accidents during operation. • Training on Handling infected animals 			
	Community Health and Safety	Training on measures to mitigate Community health and safety hazards in livestock production and prevention of hazardous substance in livestock products (milk, beef, Poultry and pork).			
2	Training on environmental issues in livestock production	<ul style="list-style-type: none"> • Impact of livestock production on the environment. • How to mitigate impact of livestock production on the environment. 	Farm managers, farm owners.		
3	Livestock waste management.	Training on livestock waste management	Farm owners, farm management, veterinarian officers, animal pen attendant.		
Total Cost					N620,000

Table 8. 1: Capacity Building Programme for Livestock Waste Management

Type of Capacity Program	Description of the Capacity Programme feasible under component 1 and 2	Responsible Agency	Estimated Budget (Naira)
Farmers Farm Assessment	<p>A Program that provides producers with state-specific worksheets to help them identify and assess the causes of nonpoint source pollution, pinpoint pollution risks on their property, and identify site-specific actions to reduce the causes of nonpoint source pollution, such as nitrogen and phosphorous nutrients, pesticides, and pathogens.</p> <p>With this assessment, the program can assist producers in developing feasible plans to prevent pollution and in locating sources of financial assistance through other programs, such as WMIP, to implement practices such as those for managing animal wastes</p>	Federal Ministry of Environment/ NESREA through the LPRES project	280,000.00
Waste Management Incentive Program (WMIP) to reduce pollution from animal and veterinary waste	<p>Provision of financial and technical assistance to animal and crop producers who agree to enter 5- to 10-year contracts to implement sound animal waste management practices that integrate conservation practices.</p> <p>Shares from 30 percent up to 75 percent of the costs to install sound waste management practices, with a maximum of \$10,000 for any fiscal year, or \$50,000 for any multiyear contract;</p> <p>Program also provides incentive payments for nutrient management or other land management initiatives.</p> <p>Focuses on priority areas such as watersheds with environmental concerns. At least 50 percent of WMIP funding is reserved to assist livestock and poultry producers; these producers must have fewer than 1,000 animal unit equivalents.</p>	Federal Ministry of Agriculture – Livestock department	3M -18M
Technical assistance on installation of Waste Management system	<p>Provides technical assistance to producers interested in installing waste management systems, such as covered lagoons and anaerobic digesters that reduce odours and recover methane gas for use as an on-farm power source.</p> <p>This list is to be periodically updated as innovative practices become available and are demonstrated to be efficacious by (FMENV and NABDA).</p>	Federal Ministry of Environment in liaison with the Federal Ministry of Agric under the LPRES project	850,000

Direct Loan	Provides direct loans of up to \$200,000, or guaranteed loans of up to \$300,000, for up to 40 years to, among other things, purchase land, construct buildings or make other structural improvements, and develop farmland to promote sound waste management that integrates soil and water conservation.		72M- 108 M
Indirect Loan	Provides direct loans of up to \$200,000, or guaranteed loans of up to \$400,000, for up to 7 years to, among other things, purchase livestock, poultry, equipment, feed, and other farm supplies; develop and implement animal waste management, soil and water conservation practices; and refinance debt.		72M -144M
Capitalization grants	Provides capitalization grants to states, which must provide a matching amount equal to 20 percent of the total grant and agree to use the money to make low-interest loans to producers for implementing animal waste management practices including to ensure that wastewater treatment facilities follow the deadlines, goals, and requirements of the NESREA Regulations on Waste Discharge in water body.		25M
Cost sharing and technical assistance	Provides cost-share and technical assistance to private landowners, including livestock and poultry producers, who are interested in implementing practices that ^a decrease overland runoff, reduce stream degradation, and improve forage production and management. Cost-share assistance under the partners program may requires a 50-percent match from the landowner. The program should have the flexibility to share costs of more or less than 50 percent, on a case-by-case basis		Case by case
Research grants and supports	Provides formula funds and grants to state agricultural experiment stations, universities, and other state institutions that conduct basic and applied research on many agricultural and livestock issues: generally focused on non-structural practices, including adding chemicals, such as aluminium sulphate, to animal waste to stabilize nutrients and control odours; adding enzymes to feed to increase an animal’s digestion of nutrients and reduce these nutrients in excrement; breeding crops containing nutrients in forms that are more readily absorbed by the animal; developing methods to reduce emissions of odour-causing compounds, ammonia, and “greenhouse” gases; and developing land-based manure management practices to reduce the movement of nutrients, pathogens, and gases into water and the air. Others include structural animal waste management, - these projects should include research on the biological treatment of waste, combining aerobic and	Private organisations/ companies in liaison with the LPRES project (meat and egg manufacturers association, Feed manufacturers)	14M

	<p>anaerobic methods; the combustion of poultry litter for on-farm energy generation; and the control of animal waste odours, including methods for covering manure storage structures and altering manure with chemical additives, to identify improved methods that livestock and poultry producers can use to treat and dispose of their animals' waste and to identify alternatives to applying waste to land.¹²</p> <p>In addition, private industry associations can fund a variety of research projects such as hybrid grains to reduce excess nutrients in animal excrement.</p>		
	Total sum of additional capacity building support		<p>(=N=187,130,000) on a need basis.</p>

¹² Meat- and egg-processing companies often enter into contractual agreements with livestock and poultry producers to facilitate economies of size to lower production costs and control for quality and uniformity in response to consumer preferences for quality and convenience-type products.

^aAnimal unit equivalents are calculated for each livestock and poultry sector according to estimated rates of manure production for each species. Thus, the number of animals representing 1,000 animal unit equivalents varies by sector. For example, the equivalent for hogs is 2,500 animals (hogs over 25 kg) and the equivalent for broilers and laying hens is 100,000 birds (confinement facilities with continuous watering systems).

8.6 Implementing the WMP

The cost of implementing this WMP is a total of all the individual costs as provided in Table 8.5

Table 8.5: Costs of implementing the WMP

Heading	Indicative Costing in Naira (₦)	Cost estimate in USD
Sites Specific WMP Mitigation Measures	25,030,000.00	\$60,900.24
Training	620,000.00	1,508.52
Monitoring Programme	900,000.00	2,189.78
Sub Total	26,550,000.00	64,598.54
Contingency	2,655,000.00	6,459.85
Total	55,755,000.00	135,656.93

(1USD =411.00)

Additional Technical and Infrastructural Support

Infrastructural capacity support for waste technologies over a period of 5- 40 years is at One hundred and Eighty-Seven Million, one hundred and thirty thousand naira only (₦187,130,000) on a need basis.

8.7 Institutional arrangements

To ensure roles and responsibilities are properly articulated, it is vital for the WMPs of the LPRES project to have institutional arrangements in place as these are also fundamental for the effective implementation of the Waste management mitigation measures outlined in this WMP. Consequently, the institutional arrangements for the project are as follows:

8.7.1 Safeguard Roles and Responsibilities of Institutions

The successful implementation of the WMP depends on the commitment of the PMU and other supporting institutions, and the capacity within the institutions to apply or use the WMP effectively, and the appropriate and functional institutional arrangements, among others. The roles and responsibilities of these levels of institutions are outlined in Table 8.6.

Table 8. 6: Waste Management Responsibilities

Category	Roles & Responsibilities
Federal Government MDAs (Federal Ministry of Environment and other agencies (Such as NESREA)	<ul style="list-style-type: none"> • Provide Policy Guidance, Institutional frameworks regarding the implementation of the WMP. • Lead role in provision of advice on waste screening, scoping, review of draft WMP report and permitting of the management infrastructural equipment's and process (in liaison with State Ministry of Environment), • Receiving comments from stakeholders, public hearing of the project proposals, and convening a technical decision-making panel, Project categorization for EA, Applicable

Category	Roles & Responsibilities
	standards, Environmental and social liability investigations, Monitoring and evaluation process and criteria, liaison with relevant stakeholders within and outside Nigeria on matter of enforcement of environmental standards, regulations, rules, laws, policies and guidelines. Disclosure of documents, where required.
State Government MDAs (Ministry of Lands, Survey and Urban Development, Ministry of Environment, etc. Other MDAs	<ul style="list-style-type: none"> • Provide project related policy decisions and guidance regarding this WMP • Ensuring compliance at State Level, on matters of Environmental Assessment, Land Acquisition and compensation and other resettlement issues • Liaise with Project Implementation Unit to ensure waste management issues are integrated into the environmental & social compliance measures to be implemented through a functional Safeguards Unit in the PIU • Intervene when relevant areas or resources under their jurisdiction or management are likely to be affected by or impacted by sub-projects particularly with respect to watershed. • Participate in the Environmental Assessment processes and in project decision-making that helps prevent or minimize impacts and to mitigate them. These institutions may also be required, issue a consent or approval for an aspect of a project; allow an area to be included in a project; or allow impact to a certain extent or impose restrictions or conditions, monitoring responsibility or supervisory oversight
FAO	<ul style="list-style-type: none"> • Recommend additional measures for strengthening the management framework and implementation performance.
World Bank	<ul style="list-style-type: none"> • Assess implementation process • Recommend additional measures for strengthening the management framework and implementation performance.
PIU Safeguards Unit	<p>Liaise closely with Ministry of Environment in preparing a coordinated response on the waste management aspects of project development in areas such as:</p> <ul style="list-style-type: none"> • Ensure that the project design and specifications adequately reflect the recommendations of the WMPs; • Co-ordinate application follow up processing and obtain requisite clearances / permits required for the project, if required; • Prepare compliance reports with statutory requirements; • Develop, organize and deliver identified training program for the PIU staff, the contractors and others involved in the project implementation, in collaboration with the PIU; • Review and approve the Contractor’s Waste Management Plan and the Implementation Plan for the environmental measures contained in the ESMP and any other supplementary environmental and social studies that may need to be carried out by the PIU; • Liaise with the Contractors and the PIU/MDAs on implementation of the WMPs;
Local government	<ul style="list-style-type: none"> • The Local Government Council has to be fully briefed and enlightened in the process and steps to be taken in the ESMF/ESMP and the overall project execution. The council should in turn encourage the LGIUs to carry out a full implementation of ESMF/ESMP responsibilities to ensure environmental and social risks on the project are effectively addressed.
NGOs/CSOs	<ul style="list-style-type: none"> • Assisting in their respective ways to ensure effective response actions, Conducting scientific researches alongside government groups to evolve and devise sustainable environmental strategies and rehabilitation techniques, Organizing, coordinating and ensuring safe use of volunteers in a response action, and actually identifying where these volunteers can best render services effectively & Providing wide support assistance helpful in management planning, institutional/governance issues and other livelihood related matter, Project impacts and mitigation measure, Awareness campaigns.
The General Public	<ul style="list-style-type: none"> • Same as above

REFERENCES

- Ilu. I.Y Frank. A. Annatte, I, Review of the Livestock/ Meat and Milk Value Chain and Policies influencing them in Nigeria. FAO, 2016
- International Finance Corporation (World Bank Group), 2007. Environmental, Health, and Safety Guidelines Meat Processing.
- International Finance Corporation (World Bank Group), 2007. Environmental, Health, and Safety Guidelines Mammalian Livestock Production.
- International Finance Corporation (World Bank Group), 2007 Environmental, Health, and Safety Guidelines Poultry Processing
- Isaac G. A. and Olanike K. A. 2007. Waste management practices at the Bodija abattoir, Nigeria Department of Veterinary Public Health and Preventive Medicine, University of Ibadan, Ibadan, Nigeria *International Journal of Environmental Studies*, Vol. 64, No. 1, February 2007, 71–82.
- Lelieveld, J., P.J. Crutzen and F.J. Dentener (1998) Changing concentration, lifetime and climate forcing of atmospheric methane. *Tellus 50B*, 128-150.
- Jabir Ali Impact of Livestock Sector for rural poverty alleviation; Asian Journal for poverty studies February 2007,
- Timothy O. William, Livestock development in Nigeria: A survey of the policy issues and option, 1989
- Taiganides, E.P., 2002, The solution to pollution. In: Global perspective in livestock waste management symposium and technology expos, pennang; Malaysia, 19-23, May 2002, (Cong H.K., Zulkifie, L., Tee, T.P. and Liang, J.B ed.). M alasia Society of Animal Production, Penang, pp1-10.
- Tatminga, S, Jongbloed, A.W, Van Eerdt, M.M., Aarts, H.F.M., Mandersloot, F., Hoogervorst, N.J.P. & Westhoek, H., 2000. THE Forfaitaire excretie van stikstof door landbouwhuisdieren [Standards for the excretion of nitrogen by farm animals], Rapport ID-Lelystad no. 00-2040R, Institut voor Dierhouderij en Diergezondheid, Lelystad, The Netherlands. Pp: 71
- Oruonye, E.D 2015. Challenges of Abattoir Waste Management in Jalingo Metropolis, Nigeria Department of Geography, Taraba State University, Jalingo, Taraba State, Nigeria. *International Journal of Research in Geography (IJRG) Volume 1, Issue 2, 2015, PP 22-31 ISSN 2454-8685 (Online) www.arcjournals.org.*
- Wagner, E.; Lanoix, J., Excreta disposal for rural areas and small communities. Monograph Series World Health Organization. 1958, 39, 182. Copyright 1958, World Health Organization.

ANNEX 1 The scope of work

Review and assess the existing legal, regulatory, and organization framework for livestock and veterinary waste management within the study areas, including the framework at the local, state and federal government levels.

To prepare a Waste Management Plan (WMP) on livestock farms, that include non-hazardous and hazardous (e.g. expired veterinary medicines, fallen stock etc.) waste. General farm waste management.

This safeguard instrument (WMP) will be disclosed before appraisal of this project. The activities relating to the preparation of the WMP are set out in the procedure's manuals of the World Bank on this matter and consultants should get familiar to these (see list of documents to be consulted). The WMP must be understood and accepted by the authorities and other national stakeholders.

Specific Tasks

The consultant should realize the following:

- Description of the legal requirements on livestock waste management (i) explaining the content of applicable national laws and regulations and implications to the project, particularly legislation relating to veterinary waste, manures, meat and products from sick animals and fallen stock. , guidance on the best option must be sought.
- Conduct an initial reconnaissance to identify the livestock waste problems and their contexts (ecological, agricultural, public health, economic, and institutional) and to define broad parameters.
- The consultant will review existing Bank documents regarding the project/program (PCD, PID, EA, PAD, according to availability). She/he will also obtain background information on livestock waste management in the country, and any existing relevant projects (e.g. through the World Bank, FAO, WHO, UNEP, UNITAR web sites; the web site of the national government; web sites of relevant CGIAR institutes, etc.)
- Assessment of capacity development needs and support needed (organizational and operational)
- Review existing waste management plan (WPM) initiatives, achievements, constraints/gaps and waste management practices and challenges in Nigeria
- Presents an overview of the potential impacts of veterinary and livestock management activities as well as mitigation measures for the negative impacts identified.
- Specify procedures for veterinary and livestock waste disposal, hazardous waste storage and disposal, Safe disposal of unwanted or expired veterinary medicines.
- Public consultation: The consultant shall discuss and interact with national NGOs, community opinion leaders, scientific experts, relevant government agencies and the private sector.
- Identify local, national and international partnerships to implement the livestock waste Management Plan

- Identify the need for collaboration between different institutions for livestock waste management
- Assess the typical time demands for proposed facilities to obtain permits and address environmental impact requirements and public participation requirements.
- Prepare a monitoring and evaluations plan for the project
- Prepare a screening checklist for future monitoring of the project
- Review and analyze existing livestock waste storage, collection and disposal systems with due regard for level of separation, the frequency of collection; and environmental and health impacts for existing treatment.

Methodology Used for Study

- Initial Site Visit and Evaluation of Project Areas
- Stakeholder Analysis, Identification, Mapping and Engagement
- Analysis of Surveys, Concerns, Interests and Studies, Project Impacts and Reporting
- Carry out comprehensive analysis for Potential impacts of veterinary and Livestock management activities and proffer environmentally friendly mitigation measures.
- Carry out comprehensive analysis of existing livestock waste storage collection and disposal system
- Develop an Evaluation and Monitoring Plan
- Establish a screening checklist for future monitoring of the project

ANNEX 2 Ambient Air Quality

Generally, air quality in the area complies with regulatory standards. Although, slight variations are noticed in major industrial cities like Lagos, Ibadan, Aba, Kano, Port Harcourt and Kaduna.

The Federal Ministry of Environment adopted the WHO standards (Table 1) as the national standards for gaseous emissions against which air quality parameters monitored are compared in order to ascertain its “cleanliness”.

Table 1: Nigerian Ambient Air Quality Standard

Air Pollutants	Emission Limits
Particulates	250 ($\mu\text{g}/\text{m}^3$)
SO ₂	0.1 (ppm)
Non-methane Hydrocarbon	160 ($\mu\text{g}/\text{m}^3$)
CO	11-4 ($\mu\text{g}/\text{m}^3$) or 10 (ppm)
NOX	0.04-0.06 (ppm)
Photochemical Oxidant	0.06 (ppm)

Source: FME 1991

Table 2: Air Quality Classification Based on Total Suspended Particles (TSP) Values

Range of TSP Values ($\mu\text{g}/\text{m}^3$)	Class of Air Quality
0 – 75	High Quality
76 – 230	Moderate Quality
231 – 600	Poor Quality

ANNEX 3 Summary of World Bank Environmental/Social Safeguard Policies

- **Environmental Assessment (OP 4.01).** Outlines Bank policy and procedure for the environmental assessment of Bank lending operations. The Bank undertakes environmental screening of each proposed project to determine the appropriate extent and type of EA process. This environmental process will apply to all sub-projects to be funded by the proposed project.
- **Natural Habitats (OP 4.04).** The conservation of natural habitats, like other measures that protect and enhance the environment, is essential for long-term sustainable development. The Bank does not support projects involving the significant conversion of natural habitats unless there are no feasible alternatives for the project and its siting, and comprehensive analysis demonstrates that overall benefits from the project substantially outweigh the environmental costs. If the environmental assessment indicates that a project would significantly convert or degrade natural habitats, the project includes mitigation measures acceptable to the Bank. Such mitigation measures include, as appropriate, minimizing habitat loss (e.g. strategic habitat retention and post-development restoration) and establishing and maintaining an ecologically similar protected area. The Bank accepts other forms of mitigation measures only when they are technically justified. Should the sub-project-specific EMPs indicate that natural habitats might be affected negatively by the proposed sub-project activities with suitable mitigation measures, such sub-projects will not be funded under this project
- **Pest Management (OP 4.09).** The policy supports safe, affective, and environmentally sound pest management. It promotes the use of biological and environmental control methods. An assessment is made of the capacity of the country's regulatory framework and institutions to promote and support safe, effective, and environmentally sound pest management. This policy was triggered by the proposed project.
- **Involuntary Resettlement (OP 4.12).** This policy covers direct economic and social impacts that both result from Bank-assisted investment projects, and are caused by (a) the involuntary taking of land resulting in (i) relocation or loss of shelter; (ii) loss of assets or access to assets, or (iii) loss of income sources or means of livelihood, whether or not the affected persons must move to another location; or (b) the involuntary restriction of access to legally designated parks and protected areas resulting in adverse impacts on the livelihoods of the displaced persons. The proposed project triggers this policy.
- **Indigenous Peoples (OP 4.20).** This directive provides guidance to ensure that indigenous peoples benefit from development projects, and to avoid or mitigate adverse effects of Bank-financed development projects on indigenous peoples. Measures to address issues pertaining to indigenous peoples must be based on the informed participation of the indigenous people themselves. Sub-projects that would have negative impacts on indigenous people will not be funded under the proposed project.

- Forests (OP 4.36).** This policy applies to the following types of Bank-financed investment projects: (a) projects that have or may have impacts on the health and quality of forests; (b) projects that affect the rights and welfare of people and their level of dependence upon or interaction with forests; and (c) projects that aim to bring about changes in the management, protection, or utilization of natural forests or plantations, whether they are publicly, privately, or communally owned. The Bank does not finance projects that, in its opinion, would involve significant conversion or degradation of critical forest areas or related critical habitats. If a project involves the significant conversion or degradation of natural forests or related natural habitats that the Bank determines are not critical, and the Bank determines that there are no feasible alternatives to the project and its siting, and comprehensive analysis demonstrates that overall benefits from the project substantially outweigh the environmental costs, the Bank may finance the project provided that it incorporates appropriate mitigation measures. Sub-projects with likelihood of having negative impacts on forests will not be funded under the project.
- Physical Cultural Property (OP 4.11)** The term “cultural property” includes sites having archaeological (prehistoric), paleontological, historical, religious, and unique natural values. The Bank’s general policy regarding cultural property is to assist in their preservation, and to seek to avoid their elimination. Specifically, the Bank (i) normally declines to finance projects that will significantly damage non-replicable cultural property and will assist only those projects that are sited or designed so as to prevent such damage; and (ii) will assist in the protection and enhancement of cultural properties encountered in Bank-financed projects, rather than leaving that protection to chance. The management of cultural property of a country is the responsibility of the government. The government’s attention should be drawn specifically to what is known about the cultural property aspects of the proposed project site and appropriate agencies, NGOs, or university departments should be consulted; if there are any questions concerning cultural property in the area, a brief reconnaissance survey should be undertaken in the field by a specialist. The proposed project will not fund sub-projects that will have negative impacts on cultural property.
- Safety of Dams (OP 4.37).** For the life of any dam, the owner is responsible for ensuring that appropriate measures are taken, and sufficient resources provided for the safety to the dam, irrespective of its funding sources or construction status. The Bank distinguishes between small and large dams. Small dams are normally less than 15 m in height; this category includes, for example, farm ponds, local silt retention dams, and low embankment tanks. For small dams, generic dam safety measures designed by qualified engineers are usually adequate. This policy does not apply to the proposed project.
- Projects on International Waterways (O 7.50).** The Bank recognizes that the cooperation and good will of riparian is essential for the efficient utilization and protection of international waterways and attaches great importance to riparian making appropriate agreements or arrangement for the entire waterway or any part thereof. Projects that trigger this policy include hydroelectric, irrigation, flood control, navigation, drainage, water and sewerage, industrial, and similar projects that involve the use or potential pollution of international waterways. The proposed project did not trigger this policy.

- **Disputed Areas (OP/BP/GP 7.60).** Project in disputed areas may occur in the Bank and its member countries as well as between the borrower and one or more neighbouring countries. Any dispute over an area in which a proposed project is located requires formal procedures at the earliest possible stage. The Bank attempts to acquire assurance that it may proceed with a

ANNEX 4 Environmental and Social Impacts General Provisions and Precautions

1. The contractor shall all necessary measure and precautions and otherwise ensures that the execution of the works and all associated operations on the work sites or off site are carried out in conformity with statutory and regulatory environmental requirement of Nigeria. The contractor shall take all measures and precautions to avoid any nuisance or disturbance arising from the execution of the work. This shall, wherever possible, be achieved by suppression of the nuisance at source rather than abatement of the nuisance once generated. In the event of any soil or debris or silt from the work sites being deposited on any adjacent land, the contractor shall immediately remove all such spoil debris or silt and restore the affected area to its original state to the satisfaction of the responsible authorities.

2. Water Quality

The following conditions shall apply to avoid adverse impacts to water quality:

- The contractor shall prevent any interference with supply to, or abstraction from, water resources and the pollution of water resources (including underground percolating water) as a result of the execution of the works.
- The contractor shall not discharge or deposit any matter arising from the execution of the work into any waters except with the permission of the contractor and regulatory authorities concerned.
- The contractor shall at all times ensure that all existing stream courses and drains within and adjacent to the site are kept safe and free from any debris and any material arising from the works.
- The contractor shall protect all water courses, waterways, ditches, canals, drains, lakes and the like from pollution, silting, flooding or erosion as a result of the execution of the works.

3. Air Quality

The following conditions shall apply to avoid adverse impacts to air quality:

- Open burning will be prohibited.
- Blasting (If any) will be carried out using small charges, and dust – generating items will be conveyed under cover.
- In periods of high wind, dust- generating operations shall not be permitted within 200 meters of residential areas having regard to the prevailing direction of the wind.
- Asphalts and hot- mix plants sites shall not be established prior to the approval of the contractor and shall be located at least 500 meters away from the nearest sensitive receptor(e.g. ,schools and hospitals).Operators will be required to install emission controls.
- Water sprays shall be used during the delivery and handling of materials when dust is likely to be created and to dampen stored materials during dry and windy weather.

- Stockpiles of materials shall be sited in sheltered areas or within hoarding, away from sensitive areas. Stockpiles of friable material shall be covered with tarpaulins. With application of sprayed water during dry and windy weather. Stockpiles of material or debris shall be dampened prior to their movement whenever warranted.
- Vehicle with an open load – carrying area used for transporting potentially dust-producing material shall have proper fitting side and tailboards. Materials having the potential to produce dust shall not be loaded to a level higher than the side and tail boards and shall be covered with a clean tarpaulin in good condition. The tarpaulin shall be properly secured and extend over the edges of the side and tailboards.
- In periods of adverse weather adverse impacts to adjacent residents or site employees during construction will be mitigated by either discontinuing until favourable conditions are restored, or, if warranted, sites may be watered to prevent dust generation, particularly at crushing plants.
- Machinery and equipment will be fitted with pollution control devices, which will be checked at regular intervals to ensure that they are in working order. Best available pollution control technologies will be used

4. Protection of soils

Borrow pits. The following conditions shall apply to borrow pits:

- Borrow areas will be located outside the ROWs.
- Pit restoration will follow the completion of works in full compliance all applicable standards and specification.
- The excavation and restoration of the borrow areas and their surroundings, in an environmentally sound manner to the satisfaction of the contractor is required before final acceptance and payment under the terms of contracts.
- Borrow pit areas will be graded to ensure drainage and visual uniformity, or to create permanent tanks\dams.
- Topsoil from borrow pit areas will be saved and reused in re-vegetating the pits to the satisfaction of the contractor.
- Additional borrow pits will not be opened without the restoration of those areas no longer in use.

Quarries. To ensure adequate mitigation of potential adverse impacts, only licensed quarrying operations are to be used for material sources. If licensed quarries are not available the contractors may be made responsible for setting up their dedicated crusher plants at approved quarry sites.

Erosion. To avoid potential adverse impacts due to erosion, the contractor shall:

- Line spillage ways with riprap to prevent undercutting.
- Provide mitigation plantings and fencing where necessary to stabilize the soil and reduce erosion.
- Upgrade and adequately size, line and contour storm drainage to minimize erosion potential.
- To avoid erosion and gulying of road formations, the contractor should reduce his earthworks during the peak of rainy seasons, use gabions and meter drains and avoid angle termination at the intersections of cuts and fills.
- As noted in elsewhere in these specifications, ditches shall be designed for the toe of slopes in cut sections with gutters or drainage chutes being employed to carry water down slopes to prevent erosion. Interceptor ditches shall be designed and constructed near the top of the back of slopes or on benches in the cut slopes as well as when there is a slope on adjacent ground toward the fill. When the roadway has a steep longitudinal slope, a drain is to be designed and constructed at the down – slope end of the cut to intercept longitudinal flow and carry it safely away from the fill slopes.

5. Avoidance of Social Impacts

To avoid adverse social impacts, the Contractor shall:

- Coordinate all construction activities with neighbouring land uses and respect the rights of local landowner. If located outside the ROW, written agreements with local landowners for temporary use of the property will be required and sites must be restored to a level acceptable to the owner within a predetermined time period.
- Maintain and clean-up campsites.
- Attend to health and safety of their worker by providing basic emergency health facilities for workers and incorporate programs aimed at the prevention of sexually transmitted diseases as a part of all construction employee orientation programs.

Obtain approval of all diversions and accommodation of traffic. A stipulated by section- which states that “the Contractor shall provide the contractor with a written traffic control plan which is to include when and where flagmen shall be employed and when and where traffic cones or other devices such as barricades and \or lights will be used. Where traffic diversions area planned for additional areas (will) be determined and the diversions clearly defined for travel.” Construct and maintain by – passes around bridges to be reconstructed until such time as the bridge is open for traffic. By- passes will be removed and the affected areas re-graded so as to blend in with the existing contour when the bridge is opened.

6. Noise

To avoid adverse impacts due to noise, the contractor shall:

- Consider noise as an environmental constraint in his planning and execution of the works.
- Use equipment conforming to international standards and directives on noise and vibration emissions.
- Take all necessary measures to ensure that the operation of all mechanical equipment and construction processes on and off the site shall not cause any unnecessary or excessive noise, taking into account applicable environmental requirements.
- Maintain exhaust systems in good working order; properly design engine enclosures, use intake silencers where appropriate and regularly regular maintain noise –generating equipment.
- Use all necessary measures and shall maintain plant and silencing equipment in good condition so as to minimize the noise emission during construction works.
- Schedule operations to coincide with periods when people would least likely be affected and by the contractor having due regard for possible noise disturbance to the local residents or other activities. Construction activities will be strictly prohibited between 10PM and 6PM.
- Incorporate noise considerations in public notification of construction operations and specify methods to handle complaints. Disposal sites and routes will be coordinated with local officials to avoid adverse traffic noise.

7. Protection of Historic and Cultural resources

To avoid potential adverse impacts to historic and cultural resources, the contractor shall; in the event of unanticipated discoveries of cultural or historic artefacts (movable or Immovable) in the course of the work, the sub-contractor shall take all necessary measures to protect the findings and shall notify the contractor and provincial- level representatives of the Archaeological committee under the ministry of Information and culture. If continuation of the work would endanger the finding, project work shall be suspended until a solution for preservation of the artefacts is agreed upon.

8. Protection of Utilities

To avoid potential adverse impacts to utilities, the Contractor shall:

- Ascertain and take into account in his method of working the presence of utility services on and in the vicinity of the site.
- Take into account in his programme the periods required to locate, access, protect, support and divert such services, including any periods of notice required to effect such work in consultation with authorities operating such services.

- Assume all responsibility to locate or to confirm the details and location of all utility services on or in the vicinity of the site.
- Exercise the greatest care at all times to avoid damage to or interference with services.
- Assume responsibility for any damage and \or interference caused by him or his agents, directly or indirectly, arising from actions taken or a failure to take action, and for full restoration of the damage.

9. **Waste Disposal and Hazardous materials**

Water and waste products shall be collected, removed via suitable and properly designed temporary drainage systems and disposed of at a location and in a manner that will cause neither pollution nor nuisance. Insofar as possible, all temporary construction facilities will be located at least 50 metres away from a water course, stream or canal. The contractor shall not dispose of used pavement material on the road or highway side, nor in water courses or wetlands. Such material shall be utilized or disposed of in places approved by the CSC.

Whenever large amounts of asphaltic concrete are to be removed from a highway, the material should be reused or disposed of by burial to a minimum of one-meter depth. The contractor shall not dispose of any surplus material on private land unless authorized by in writing by the owner(s), authenticated before a notary public, and with previous authorization of the CSC.

10. **Environmental monitoring**

Monitoring or direct impact will be carried out by the CSC and will include, but not restricted to, the following concerns:

- Erosion along highway segments and borrow sites during and after construction;
- Silting and increased sediment loads to streams crossed by the highway
- Prevention of damage to undiscovered significant archaeological or historical findings;
- Verification that proper waste disposal at construction sites and road camps is done;
- Assurance that construction sites and road camps are cleaned after construction and
- Inspection of vegetation covers (removal and re- growth) on the basis of field examinations.

ANNEX 5 Attendance at Pig Farmers Association Stakeholders Meeting

ATTENDANCE PIG FARMERS ASSOCIATION OF NIGERIA			
PIG ASSOCIATION		(PFAN) PHONE NO	
NAME	August 2, 2018		
1) Oluwoyin Oluwale			08028539794
2) Mrs Modupe Salvador			08033128435
3) Oshin 499 E. Abiodun (Mr)			08036222852
4) Edema-Sillo E.A			08033237184
5) Adoga A S			08034076949
6) Olubukola Oyemekun (Mrs)			08034812436
7) Ola Joshua			08034750191
8) Chris Chukwuocha			08037267728
9) HENRY OKOSODO			08064459179
10) Dr Solomon Olomo D.			08135072982
11) Olayinka Bolade			
12) Dominic Ageebee			08092009001
13) Kunle Kehinse			08055800955
14) Aadedayo Ogunsile			08077838286
15) Onabowale Oluwoji			08059199324
16) Adediran Oluwole			07089560605
17) Funmi-Adeshina, Olajumoke			08080615218
18) FADIPE S.S. (M/F)			08023100758
19) Ademuga Oluwale A.			08028997248
20) Mrs Ime Ndiokho			08024056029
21) Mrs ALORA			08032304801
22) FANTALE, SAMSON			08023132496
22) David Ogal			08039246886
23) Adeniji B. Nelson			08033807316
24) Ueri Motunrayo			09171367422
25) Ms Simplice Kladyet			08093290531/07038010024
26) Mrs Funmi Ojewale			08033017022
27) OTELAKIN TOSIN MATTHEW			07036870912 SW PFAN Chair
28) Bamisaye Inisoluwa Gloria			07034297995
29) Oso, Emmanuel Tosin			09039591585
			07084575555

ANNEX 6: Photo speak of consultations at selected states.



Plate 4. 1: Consultation Pictures with Plateau State Ministry of Agriculture Officials



Plate 4. 2: Consultation with the Perm Sec. Ogun State Ministry of Agriculture





Plate 4. 3: Consultation with Animal Care Konsults – Ogun State





Plate 4. 4: Consultation with the Pig Farmers Association, Gberigbe, Ikorodu – Lagos



Plate 4. 5: Consultation with WAMASON officials

ANNEX 7: Screening checklist for future monitoring of projects

Projects, be they large or small, have the potential to adversely impact the environment, and depending on their location, can be vulnerable to natural hazard impacts. A simple questionnaire to guide decision making on the waste management issues that can arise from the LPRES project is stated below:

	Issues or considérations		Yes	No	Unknown	N/A
1	Is there a plan to compost, recycle, reuse and reduce and/or properly dispose of wastes generated?					
2	Will the project generate sewage and/or include a wastewater treatment solution?					
3	Will construction and/or operation of the project cause significant changes to the receiving environment's water resources and/or area drainage patterns (on-site or off-site, short term or long term)					
4	Will the project involve the build-up or accumulation of waste from project activities					
5	Will the project involve the use of hazardous materials e.g. chemicals, vaccines, pesticides, poisonous gases					
6	Will the facility operation generate special waste streams that require special handling (e.g. biomedical waste, veterinary waste, waste oils)					
7	Will the project be located in a polluted or contaminated area or close to a waste dump site?					
8	Is the proposed site within the catchment area for regular collection and disposal of municipal solid waste?					

ANNEX 8: Waste Management System Screening Checklist for Livestock Farms

Name of farm _____

Date visited _____

Copy of site plan or design plan-----

S/N	Question/ Description	Yes	No	N/A	Remarks/ Explanation
General question about the Farm					
1	Year farm was established?				
2	Farm Capacity				
3	Types of Animals on farm				
	• Cattle				
	• Goats and sheep				
	• Pigs				
	• Chicken				
	• Turkey				
	• Grasscutter				
	• Bees				
	• Snail				
	• Fishes				
	• Others (specify)				
4	Farm strength				
5	Source of water at the farm				
6	Animal feeding operation				
	• Confinement system				
	• Pasture system				
	• Operation houses or feeds animals for more than 45days rolling in any given 12 months				
7	Available feed mill section. If No, source of feeds?				
8	If the above is yes, source of raw materials for feed production				
9	Availability of processing section.				
General Safety					
10	Safety signs around the farm?				
11	Use of PPE on site				
12	Good housekeeping status				
13	Available hazard areas & Requisite restriction				
	• Confined spaces				
	• Above ground tanks, ponds and liquid storage structures				
	• Equipment				
	• Fences				
14	Available first aid box				

15	Available fire extinguisher				
16	Available muster point				
17	On site clinic/ veterinary officer				
Waste Management					
18	What type of waste can you see within or generated in the farm				
19	Types of livestock housing and environments encountered during collection of freshly deposited livestock waste Samples				
	• Straw-bedded yard				
	• Cubicle				
	• Cowshed				
	• Straw yard				
	• Loose-straw yard				
	• Free range				
	• Kennels				
	• Part bedded				
	• Pen (Closed or Open)				
	• Cage				
20	Indicate Collection system • Flush system • Scrape system				
21	Collection component of animal waste • paved alleys, • gutters, and • slatted floors				
22	Tick/ Outline the farm management of stored waste				
	• Stores to which fresh manures are continually added				
	• Stored manures that contained bedding materials				
	• Stores that are never turned, stirred, or otherwise aerated				
23	Tick / Outline On site type of storage				
	Heap on pad or yard				
	Field heap				

	Lagoon				
	Weeping-wall store				
	Below-ground tank				
	Above-ground tank				
	Strainer box				
	Covered shed				
24	Tick on -site Bedding types				
	<ul style="list-style-type: none"> • Straw 				
	<ul style="list-style-type: none"> • Sawdust 				
	<ul style="list-style-type: none"> • Woodchips 				
	<ul style="list-style-type: none"> • Sand 				
	<ul style="list-style-type: none"> • Others (specify) 				
25	Do they have a treatment plant				
26	Indicate onsite Treatment options through <ul style="list-style-type: none"> • biological, physical, and chemical processes. • using such components as lagoons, oxidation ditches, composting, and constructed wetlands. 				
27	On site utilization options <ul style="list-style-type: none"> • Nutrient management • Land application • Bioenergy production 				
28	On site mortality management <ul style="list-style-type: none"> • Rendering and freezing • Incineration • Gasification • Sanitary landfill • Burial • Composting • Emergency mortality management 				
29	Environmental risk for pollution at site location <ul style="list-style-type: none"> • Surface water • Subsurface water • Residential areas • Climatic conditions • Zoonotic diseases 				

30	Regulatory Permits on site				
31	Waste management operational cost in % of total farm operation				

[1] Currently, over 25 percent of smallholder stock is lost to mortality from preventable and treatable diseases.

[2] OIE PVS (Performance of Veterinary Services) evaluation mission follow-up report (2019). Available at: https://rr-africa.oie.int/wp-content/uploads/2020/02/20190626_nigeria-pvs-fu-report_final-1.pdf.

[3] Nigeria is participating in the global PPR eradication programme.

[4] In particular the Regional Disease System Support Enhancement Program (REDISSE).

[5] These studies will include: (i) market assessment; (ii) preliminary design, including programming of climate-proof and energy-efficient construction; (iii) the study of options for optimal financing and management models—public-private partnerships (PPPs), build-operate-transfer (BOT) arrangements, or other concessionary agreements); and (iv) related Environmental and Social Impact Assessments (ESIAs).

[6] Mainstreaming Eco-Industrial Parks, World Bank Group, 2016.

[7] Meat- and egg-processing companies often enter into contractual agreements with livestock and poultry producers to facilitate economies of size to lower production costs and control for quality and uniformity in response to consumer preferences for quality and convenience-type products.

^a Animal unit equivalents are calculated for each livestock and poultry sector according to estimated rates of manure production for each species. Thus, the number of animals representing 1,000 animal unit equivalents varies by sector. For example, the equivalent for hogs is 2,500 animals (hogs over 25 kg) and the equivalent for broilers and laying hens is 100,000 birds (confinement facilities with continuous watering systems).

ANNEX 9: Waste Management System Screening Checklist for Abattoirs

	Items/Sub- Items	Deficiency Scores					Deficiency comments/Description
		Minor	Major	Serious	Critical	N/A	
A	Building and premises						
1	free from objectionable odor,dust, ash						
4	not subject to flooding						
5	provided with perimeter fence						
7	unused materials, equipment and other things stored properly						
8	no harborage, breeding place or sign of its activity						
	Kept clean						
	ground paved/ compact with gravel						
	Good house keeping						
B	Solid Waste Disposal						
	with wastes receptacles and properly labeled						
	with segregation scheme of kind of solid wastes						
	receptacles kept clean						
	removed after every shift or as needed						
	equipment storage area kept clean						
	satisfactory method of disposal						
C	Sewage and waste disposal system						
	properly constructed and covered						
	sufficient to carry peak load						
	have adequate traps, vents & catch basins						
	solid wastes properly disposed						
	updated discharge permit						
	sufficient to carry peak load						
	updated discharge permit						
	separate entrance for clean and dirty area						
	Drainage w/ sufficient capacity						
D	Design and construction						
	made of impervious and non-slip material						
	proper floor-wall joint (coved or rounded)						
	kept reasonably clean during slaughtering						

ANNEX 10: Waste Management System Screening Checklist for Livestock Markets

A		
1	Workplace environment free from hazards/aspects	
4	Hazardous or combustible material- department wise marked and noted?	
5	General housekeeping, chemical fumes, burning gaseous emission controlling methods?	
7	Lighting, temperature and ventilation- offices, workplaces, toilets, canteen and pantry	
	Personal protective equipment- department activities respectively ?	
	Electrical outlets and wires are safe- general admin areas walls	
	Machinery/appliance guard- each rotating things, wheel, drains etc.	
	Building structure should be stability certified.	
	Proper air circulation- each department, storage room, work places, general areas were covered by wall ?	
	General hazards/aspect like batteries etc, disposal records, verify the authorised persons who are collecting all	
	All required permits like, noise level air emissions	
	Wastes management	
	Segregation of hazardous water and water treatment	
	Control pollution level	
	Water quality sample	
	Spill records	
	MSDS(material safety data sheet)	

ANNEX 11: Stakeholder Consultation Records (2021)

Date	2 nd December, 2021
Time	4: 30pm – 6:28pm
Venue	Virtual (Zoom)
Attendance	72 (with records of 67 participants)
Stakeholders in Attendance	LPRES Government Preparation Team, 17 State Teams, NGOs and Livestock Breeder Associations, LPRES E & S Consultants, FMEEnv
Language	English

Objectives of the meeting: The objectives of the meeting are as follows;

1. To discuss revisions made to the LPRES project and changes made to the safeguard instruments
2. To obtain feedback and input of stakeholders on the instruments

Overview of Discussions: Sequel to the revision of the safeguard instruments prepared for the LPRES project in 2018 and disclosed in-country, some project components and the geographical coverage of the project had undergone some changes.

Following guidance provided by the Bank E&S specialists, the ESMF has been revised in some aspects. Main revisions to the instruments affect the following issues;

1. Occupational Health & Safety
2. Gender-Based Violence
3. Labour Influx
4. Fragility and Ongoing Conflict

The review led to a strengthening of the ESMF by;

1. Improving the analytical work done in the environmental and social baseline around the identified issues
2. Improving the legal framework review
3. Enhancing the mitigation with more action particularly those related to Gender-Based Violence

Feedback from stakeholders

In response to the presentation on the revisions made to the safeguard instruments, participants at the meeting provided feedback which are captured in the discussion log shown in the table below;

Issue/Concern Raised	Issue Raised by	Action Required/Response Provided
Environmental and Social Issues		
Regular conflict between herders and farmers can be reduced if state governments subscribe to agricultural insurance products being designed under the Nigeria Agric Insurance Scheme (NAIS). Does LPRES have plans to facilitate the use of such insurance products to protect farmers and herders who lose crops and their herds because of these conflicts? This will help in managing the potential for conflict which has been identified as part of the Environmental and Social Assessment	Azubuikwe Nwokoye (ActionAid, Nigeria)	This is an emerging area that the government preparation team will consider in going forward.
How would the GBV mitigation component be implemented? It is important that a comprehensive package of GBV mitigation actions including mapping of services and provision of multi-sectoral survivor-centered services should be made available.	Dr. Princess (New Initiative for Social Development)	This has already been included into the ESMF.
LPRES was not prepared under the World Bank Environmental & Social Framework which has more robust provisions on Labour and Working Conditions under ESS2. However, it would have been nice to	Mrs. Odetoro (FMEnv)	The ESMF addresses Labour Influx being a relevant social concern of LPRES due to the sensitivity of

include Labour Management Procedures into the ESMF.		likely project sites to an incoming population of project workers
Will there be provision for a landscaping program for planting edible grass along highways at state and national level as seen in the Netherlands as a way of also controlling erosion?	Chukwuemeka Ogbuagu	Noted. This would be a suitable mitigation measure for remediating land cleared for construction purposes during the decommissioning phase project activities involving construction work under component 2 and 3.
How would issues of involuntary resettlement and restriction of access and use rights be addressed under LPRES?	Mrs Lai-Solarin (FMARD)	The Resettlement Policy Framework is the instrument which is prepared to address risks related to resettlement and restrictions on land use.
Other issues related to other project areas		
L-PRES should work on educating cattle breeders on the adoption of the use of high yielding breeds of cattle for better productivity	Emmanuel Naandokol (Jos)	Noted
Needed information on the timeline of the project	Emmanuel Kwapdimma	The project is still in the pipeline and is being prepared for approval by the World Bank board. Post-approval, there are still a few processes to be undertaken before the project becomes effective
Needs information as to when the project is commencing, highlighting the need to move from deliberation and consultations to implementation.	Madu Samuel	
Why is the project not focused on ranching? Ranching is a practice that would help to resolve most of the problems related to clashes between herders and farmers	Azubuike Nwokoye (ActionAid, Nigeria)	LPRES is not solely about ranching. The project will support different technologies and practices that could potentially improve the yield and productivity of livestock in different parts of the country.
Does L-PRES cover all livestock or is it cattle-specific?	Paul-Richards Obiora (Pig Farmers Association of Nigeria)	The scope of the project covers all other value chains. The reason why cattle appear to get more attention is because of the volatile nature of cattle rearing in the country.

Attendance

SN	Participants Name	Organization
1	Winnie Lai-Solarin	FMARD
2	Dr. Princess Olufemi-Kayode	New Initiative for Social Development (NISD)
3	Oluwatosin Oso	Consultant, WBG
4	Hamza Sajim	ARDS, SPDO FCT
5	Ezeudegbunam Eucharua	Procurement Unit, LPRES Preparation Team, FMARD
6	Osegbue Anthony Ikechukwu	LPRES HQ
7	Ibitayo Femi James	Animal Husbandry Unit, L-PRES FG Preparation Team
8	Peter Alike	Animal Husbandry Unit, LPRES Preparation Team
9	Adamu Dakogi	Head, Animal Herds Unit
10	Samuel Alabi	Head, M&E Unit, L-PRES FG Preparation Team
11	Kunle Adeoye	Procurement Unit, L-PRES Preparation Team
12	Sawiyu Jimoh	Accounts Unit, LPRES FG Preparation Team
13	Ekene Adokwe	Anambra State

14	Wihioka Stella Nnene	Animal Husbandry Officer, Rivers State FMARD
15	Dr. Junaid	L-PRES Kano State
16	Shehu Ahmed Shehu	SPDO Katsina
17	Mohammed Awwal Abdullahi	Extension Officer Borno State L-PRES
18	Balarabe Karaye	Perm Sec, Kano State MARD
19	Emmanuel Naandokol	Animal Husbandry Officer, Plateau State
20	Busayo Obisesan	WBG
21	Dr. Mustapha Koguna	Animal Health Officer, LPRES Kaduna State
22	Babatobi Olatunde Damola	Senior Livestock Developmet Officer, FMARD, Ekiti State
23	Paul-Richards Obiora	Coordinator, Pig Farmers Asociation, Anambra State
24	Nwankwo Kingsley Chinedu	Health Officer, L-PRES, Anambra State
25	Chukwuemeka Ogbuagu	Extension Officer, Anambra State
26	Dr. Kujumah Wasa	Perm Sec, Niger State Min. of Livestock and Fisheries
27	Dr. Solomon	Vet. Officer, Anambra State
28	Shehu Samaila	Livestock Developmet Officer, Katsina State
29	Zainab Ahmed	M&E, L-PRES, Katsina State
30	Nura Ahmed	M&E, Niger State
31	Makinta Alhaji Ali	PDO, Borno State
32	Hananiah G. Albert	Deputy Director, Livestock, L-PRES SPDO Taraba State
33	Mansur Hamidu	ICT Officer, Niger State
34	Adewale Michael Sunday	Senior Animal Husbandry Officer, Osun State
35	Ajani Lukmon Adekunle	Senior Animal Husbandry Officer, Lagos State
36	Azubike Nwokoye	Food and Agriculture Programme Coordinator, ActionAid Nigeria
37	Adegbulu Foluke Helen	Ondo State
38	Olusegun Alajo	Ondo State
39	Ikpikhumi Betsy	L-PRES, Aimal Husbandry Officer, FMARD. Edo State
40	Amaranjo Eugene	Imo State
41	Iwuoha Agnes	Chief Animal Health Officer, Imo State
42	Adeogun Olufemi	L-PRES Ondo State
43	Tukur Abdullahi	Extension officer, Katsina State
44	Jiya D. Mohammed	SPDO Niger State
45	Mr Aniefiok F. Isong	Director, Animal Husbandry, Akwa Ibom state
46	Ebri Ekpenyong	Nasarawa State FMARD
47	Mrs. Odetoro	FMEnv
48	Prof. Daniel Ezeokoli	President, Anambra State Pig Association
49	Sokari Christian Dearson	FMARD Rivers State DAHS
50	Nnamdi Aforka	Animal Health Unit, FMARD-LPRES FG Preparation Team
51	Engr. Steve Tsado	New Initiative for Social Development (NISD)
52	Mrs. Ono	FMEnv
53	Sani Alexander	National Project Accountant. L-PRES FGPT
54	Madu Samuel	Livestock farming, Anambra State
55	Abubakar Anka Bello	Animal Husbandry Officer (FMARD) Zamfara State
56	Umoh Uwem Sunday	Chief Animal Husbandry Officer, FMARD Kaduna
57	Louis-Marie Anokwu	Operations Unit L-PRES
58	Hassan Adamu Hassan	Livestock officer, Borno State
59	Babaginda Shehu	Communication Unit L-PRES FGPT
60	Isiadinso Raymond O	President, FIPAN, ASAN
61	Emmanuel Kwapdimma	
62	Aminu Jidda	MIS Officer, L-PRES, Borno State
63	Olakitan Oluwagbuyi	
64	Valentine Omeje Ikechukwu	
65	Cordelia Chiagozi	

66	Iwuoha Agnes	
67	Biodun Oyeleye	New Initiative for Social Development

