KANO STATE

APPEALS PROJECT

AGRO-PROCESSING, PRODUCTIVITY ENHANCEMENT AND LIVELIHOOD IMPROVEMENT SUPPORT PROJECT

WORLD BANK

AGRO-PROCESSING, PRODUCTIVITY ENHANCEMENT AND LIVELIHOOD IMPROVEMENT SUPPORT PROJECT (APPEALS)

KANO STATE COORDINATION OFFICE

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

FOR

PRIORITY VALUE CHAINS OF RICE, WHEAT AND TOMATO

REPORT

MARCH, 2021

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TABLE OF CONTENTS

TABLE OF CONTENTS iii
LIST OF TABLES v
Table 7.2: ESMP Implementation Schedule 152 vi
Table 7.3: Cost Analysis of the Proposed Project ESMP Implementation 153 vi
LIST OF FIGURES vii
Figure 7.1: Kano State APPEALS Organogram 108 vii
LIST OF PLATES viii
Plate 4.12: Flora Vegetation 59 viii
ABBREVIATIONS AND ACRONYMS ix
EXECUTIVE SUMMARY x
CHAPTER ONE 1
1.0 INTRODUCTION 1
1.1 Background 1
1.2 Rationale for the Proposed Project 3
1.3 Purpose of the ESIA 4
1.4 Objectives and Scope of the Consultancy 4
1.5 Scope of Work for the ESIA Study 5
1.6 Approach/Methodology for the ESIA Study 7
1.6.1 Review of Available Literature 7
1.6.2 Field surveys and site inspection 8
1.6.3 Public/Stakeholder Identification and Consultations 8
1.7 Structure of the ESIA Report 8
CHAPTER TWO 12
2.0 INSTITUTIONAL AND LEGAL FRAMEWORK 12
2.1 Federal Policy, Legal, Regulatory and Administrative Frameworks 12
Environmental Impact Assessment Act No. 86, Guidelines for review of EIA report in Nigeria. 13
National Guidelines on Environmental Management Systems 13
Land Use Act 13
Criminal Code 13

2.2 World Bank Operational Safeguard Policies triggered by APPEALS Project in Kano State 15

2.3 Institutional Framework 19

CHAPTER THREE 20

3.0 PROJECT DESCRIPTION AND ALTERNATIVES 20

3.2 Current Status of Agricultural Activities in Kano State 21

3.3 Proposed Project Activities 25

3.4 Project Alternatives 26

CHAPTER FOUR 29

BASELINE ENVIRONMENTAL AND SOCIAL CONDITIONS 29

4.1 Physical Environment 29

4.1.1 Climate and Meteorology 30

4.1.1.1 Rainfall Characteristics 30

4.1.1.2 Ambient Temperature Characteristics of Kano State 32

4.1.1.3 Relative Humidity (RH) of Kano 34

4.1.1.5 Wind Speed Characteristics of Kano 35

4.1.2 Geology and Hydrogeology of Kano State 36

4.2 Water Quality 38

4.2.1 Water Quality Results at Bugau Rice Farms 39

4.2.3 Soil quality at Bugau rice farms 43

4.2.4 Water Quality Results at Alkamawa Wheat Farms 44

Surface Water (Dry Season) 44

4.2.5 Air quality and noise at Alkamawa Wheat farms 48

Table 4.10: In-situ air quality assessment of wheat farms at Alkamawa 50

4.2.6 Soil Quality Results of Alkamawa Wheat Farms 51

4.2.*7* Water Quality Results at Yadakwari Tomato Farms 52

Groundwater and Surface Water (Dry Season) 52

4.2.8 Air Quality and Noise 54

4.2.9 Soil Quality 56

4.2.10 Biological Environment 57

Flora and Fauna 57

Plate 4.12: Flora Vegetation 58

4.2.11 Forest and water resources 60
4.3 Socio-Economic Environment 62
4.3.1 Stakeholders Consultations 65
Consultations with community members 66
Consultations with NESREA staff 67
Consultations with the staff of Kano State Ministry of Women Affairs 68
Consultations with the staff of Kano State Ministry of Environment 68
Consultations with the Non-Governmental Organisations (NGOs) 68
General Observations from the Consultations 69
CHAPTER FIVE 70
POTENTIAL ENVIRONMENTAL/SOCIAL IMPACT IDENTIFICATION AND EVALUATION 70
5.1 Methodology for Impact Identification and Evaluation 70
5.1.1 Impact Identification 70
5.1.2 Impact Prediction 71
5.1.3 Impact Evaluation 71
5.2 Project Activities of Environmental and Social Concern 73
5.3 Evaluation of Potential Impacts of the Proposed Intervention 74
5.3.1 Potential Positive Environmental and Social Impact 74
5.3.2 Potential Negative Impacts 76
CHAPTER SIX 81
MITIGATION MEASURES 81
6.1 Types of Mitigation Measures 81
6.1.1 Preventive Measures 81
6.1.2 Control Measures 81
6.1.3 Compensatory Measures 82
6.2 Summary of Significant Potential Adverse Impacts 82
6.2.1 Operations and Maintenance of Farm Access Roads and small Dams 83
6.2.2 Air quality and noise 83
6.2.3 Water quality 84
6.2.4 Ecology and biodiversity 86
6.2.5 Wildlife and forestry 86

6.2.6 Socioeconomic and community health 87
6.2.7 Value Addition and Processing Activities 88
6.3 Mitigation Measures for Significant Potential Adverse Impacts 88
CHAPTER SEVEN 106
ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP) 106
7.1: Objectives of the ESMP 106
7.2: The Environmental and Social Management Plan 106
7.3 Institutional Arrangements, Responsibilities and Accountabilities 106
7.3.1 Project Management Unit 107
7.3.2 Environmental and Social Safeguards Unit 109
7.4 ESMP Measures 111
7.4.1 Flora and Fauna Management Plan 111
7.4.2 Waste Management Plan 112
7.4.2.1 Recommended Measures for Waste Management 112
7.4.3 Erosion and Sedimentation Management Plan 113
7.4.4 Employment, Training and Awareness Management Plan 114
7.4.5 Water Management Plan 114
7.4.6 Chemical Management Plan 115
7.4.7 Air Quality Management Plan 116
7.4.8 Vegetation Clearing and Biomass Management Plan 117
7.4.9 Emergency Response and Incident Management Plan 117
7.4.10 Cultural Heritage Management Plan 118
7.4.12 Social Investment Plan 119
7.4.13 Health, Safety and Security Management Plan 120
7.4.14 Community Health and Safety Plan 122
7.4.15 Stakeholders Engagement Plan 123
7.4.16 Training Programmes 124
7.4.17 Coronavirus (Covid-19) Safety Management Plan 124
7.4.17.1 Workers safety under Coronavirus (Covid-19) 125
7.5 Monitoring 126
7.6 Grievance Redress Mechanism (GRM) 127

7.6.1 Kano APPEALS GRM Process 127
7.6.1.1 Stages of Complaint and Appeal Levels 128
7.6.1.2 Grievance Uptake Points 132
7.6.1.3 Grievance Redress Procedures 133
7.6.1.4 Roles and Responsibilities of Grievance Redress Implementers 136
7.7 Labour Influx, Child Labour and Gender Based Violence (GBV) 139
7.7.1 Labour Influx 139
7.7.2 Child Labour 140
7.7.3 Gender Based Violence 140
7.7.3.1 GBV Risk Management Mechanisms 140
7.7.3.2 Guiding Principles in the Care and Management of Victims of Gender Based Violence 142
7.7.3.3 General Code of Conduct on Preventing Gender Based Violence and Violence Against Children 142
7.8 Stakeholder/Citizen Engagement 143
7.8.1 Fundamentals of Stakeholder Engagement Approach 144
Consultations 144
7.9 Training Programmes 145
Table 7.3: Institutional Capacity Strengthening Plan 145
7.10 Implementation Schedule 145
7.10 ESMP Costing and Cost Analysis 147
CHAPTER EIGHT 148
CONCLUSION 148
References 150
Annexes 152
Annex I: Sample of Socioeconomic Questionnaire and Checklist 152
Consultations with community members 162
Consultations with NESREA staff 164
Consultations with the staff of Kano State Ministry of Women Affairs 164
Consultations with the staff of Kano State Ministry of Environment 164
Consultations with the Non-Governmental Organisations (NGOs) 165
General Observations from the Consultations 165

Annex i: Lists of Community members consulted (FGD) 166

LIST OF TABLES

Table 1.1: Participating States and their Priority Value Chains 2
Table 2.1: Relevant Federal / Kano State Policies, Legislation, Regulations and Guidelines 12
Table 2.2: World Bank Environmental and Social Safeguard Policies Applicable to Kano-APPEALS Agriculture Intervention Clusters 16
Table 2.3: International Conventions, Agreements and Protocols to which Nigeria is Signatory and Applicable to the Kano State APPEALS Sites 17
Table 2.4: Gap between National Legislations, Policies and Regulations and the World Bank Policies 18
Table 3.1: Project Components and Activities 26
Table 3.2: Analysis of the Alternatives 28
Table 4.1: Kano Average Monthly Rainfall (2000 – 2019) 31
Table 4.2: Average Monthly Temperature Characteristics of Kano State 32
Table 4.3: Average Monthly Relative Humidity 34
Table 4.4: Average Monthly Wind Speed 35
Table 4.5: Groundwater and surface water quality assessment at Rice Farm, Bugau town, Kura, along Rano Road (dry season) 40
Table 4.6: In-situ air quality assessment of rice farms at Bugau 42
Table 4.7: Physicochemical and microbial parameters of top soil (0-15) cm and subsoil (15-30) cm at Bugau Rice Farms, Kano State 44
Table 4.8: Groundwater and surface water quality assessment at Wheat Farms, Alkamawa town, Bunkure, Kano State (dry season) 46
Table 4.9: Underground water quality parameters at Alkamawa wheat farms 47
Table 4.10: In-situ air quality assessment of wheat farms at Alkamawa 50
4.11 Physicochemical and microbial parameters of top-soil (0-15) cm and sub-soil (15-30cm) at Alkamawa wheat farms (AWFs) 52
Table 4.12: Underground water and surface water physicochemical parameters of Tomato Farms at Yadakwari, Garun Malam, Kano State 53
Table 4.13: In-situ air quality and noise level assessment carried out at Tomato farms at Yadakwari,Garun Malam, Kano State 55
Table 4.14: Physicochemical and microbial parameters of top-soil (0-15) cm and subsoil (15-30) cm at Yadakwari, Garun Mallam, Kano State 57
Table 4.15: Plant species found around rice, wheat and tomato farms in Kano 59
Table 4.16: Animal species found around rice, wheat and tomato farms in Kano 60
Table 4.17 Demographic and other attributes of the rice, wheat and tomato farmers in Kano 61
Table 4.18: Awareness of APPEALS project, Strengths, weaknesses, opportunities and threats 65
Table 5.1: Impact Evaluation Matrix 72
Table 5.2: Evaluation of Potential Positive Impacts 75
Table 5.3: Evaluation of Potential Negative Impacts 78
Table 6.1: Ambient Air Quality Standards 84
Table 6.2: Groundwater Quality Standards 85
Table 6.3: Mitigation Measures for Significant Potential Adverse Impacts of construction and maintenance of farm access roads and small dams 89
Table 6.4: Mitigation Measures for Significant Potential Adverse Impacts for Rice Production 93
Table 6.5: Mitigation Measures for Significant Potential Adverse Impacts for Rice Processing 96

Table 6.6: Mitigation Measures for Significant Potential Adverse Impacts for Wheat Production 98
Table 6.7: Mitigation Measures for Significant Potential Adverse Impacts for Wheat Processing 101
Table 6.8: Mitigation Measures for Significant Potential Adverse Impacts for Tomato Production 103
Table 6.9: Mitigation Measures for Significant Potential Adverse Impacts for Tomato Processing 105
Table 7.1: Risk Safety Control 121
Table 7.2: Emergency response Plan 122
Table 7.3: Institutional Capacity Strengthening Plan 145
Table 7.4: ESMP Implementation Schedule 146
Table 7.5: Cost Analysis of the Proposed Project ESMP Implementation 147

LIST OF FIGURES

Figure 3.1: Kano State in Nigeria 20
Figure 3.2 Map of Kano State 21
Figure 4.1: Annual Rainfall Amount in Kano (2000-2019) 30
Figure 4.2: Kano Average Monthly Rainfall (2000 – 2019) 31
Figure 4.3: Annual Number of Rainy days in Kano (2000-2019) 32
Figure 4.4: Average Monthly Temperature of Kano State 33
Figure 4.5: Average Monthly Minimum and Maximum temperatures of Kano State 34
Figure 4.6: Average Monthly Relative Humidity 35
Figure 4.7: Average Monthly Wind speed in Kano State 36
Figure 4.8: Geological Map of Kano State. (Inset) Location of Kano in the Geological Map of Nigeria. 37
Figure 7.1: Kano State APPEALS Organogram 108
Fig. 7.2 Kano APPEALS GRM Structure 129

LIST OF PLATES

Plate 3.1: Rice Production at Bagwai, Kano 22

Plate 3.2: Wheat Cultivation at Alkamawa, Bunkure 22

Plate 3.3: Wheat Cultivation at Alkamawa, Bunkure 23

Plate 3.4: Rice Parboiling at Kura 23

Plate 3.5: Rice Drying at Kura 24

Plate 3.6: Burning Wastes of Rice at Kura 24

Plate 3.7: Wheat Processing into *Gurasa* at Dala 25

Plate 4.1: Collection of Water Sample at Bugau Rice Farm 39

Plate 4.2: In-situ Measurement of Air quality at Bugau Rice Farm 41

Plate 4.3: In-situ Measurement of Noise at Bugau Rice Farm 43

Plate 4.4: In-situ Collection of Surface Water Sample at Alkamawa Wheat Farm 45

Plate 4.5: Underground Water Sample 48

Plate 4.6: In-situ Measurement of Air at Alkamawa Wheat Farm 48

Plate 4.7: In-situ Measurement of Noise at Alkamawa Wheat Farm 50

Plate 4.8: In-situ Measurement of Soil Sample at Alkamawa Wheat Farm 51

Plate 4.9: In-situ Measurement of Air at Yadakwari Tomato Farm 54

Plate 4.10: In-situ Measurement of Noise at Yadakwari Tomato Farm 55

Plate 4.11: In-situ Measurement of Soil at Yadakwari Tomato Farm 56

Plate 4.12: Flora Vegetation 58

ABBREVIATIONS AND ACRONYMS

APP	Agricultural Promotion Policy
APPEALS	Agro-Processing, Productivity Enhancement and Livelihood Improvement Support Project
APS	Agro-Processing Specialist
ATA	Agricultural Transformation Agenda
CADP	Commercial Agriculture Development Project
CBDO	Commercialization and Business Development Officer
CFRN	Constitution of the Federal Republic of Nigeria
COD	Chemical Oxygen Demand
COO	Communication Officer
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
FEPA	Federal Environmental Protection Agency
FGD	Focus Group Discussion
FMARD	Federal Ministry of Agriculture and Rural Development
FME	Federal Ministry of Environment
FMOH	Federal Ministry of Health
GBV	Gender Based Violence
GDP	Gross Domestic Product
GHG	Green House Gases
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
IITA	International Institute for Tropical Agriculture
IMM	Impact Mitigation and Monitoring
IOP	Internal Operation Plan
IR	Initial Risks
M&E	Monitoring and Evaluation
NCO	National Coordinating Office
NESREA	National Environmental Standards and Regulations Enforcement Agency
PAP	Project Affected Person
PDO	Project Development Objectives
PES	Productivity Enhancement Specialist
PPE	Personal Protective Equipment
RIE	Rural and Infrastructure Engineer
SCO	State Coordinating Office
SPC	State Project Coordinator
SS	Solid Solution
TOR	Terms of Reference
WYEL	Women and Youths Empowerment and Livelihood

EXECUTIVE SUMMARY

Agro-processing, Productivity Enhancement and Livelihood Improvement Support (APPEALS) Project is a World Bank assisted project prepared by the Federal Ministry of Agriculture and Rural Development. The Project aims at transitioning of small and medium farmers' production system to market oriented agriculture. The project builds on ATA/CADP and planned to support the Federal Government's policy on: food security, local production, job creation and Economic Diversification. The PDOs of the project are to: Increase in productivity of agricultural produce of the priority value chains by the project supported farmers, Increase of processed output of the priority value chains by project beneficiaries and number of beneficiaries supported by the Project (of which women and youths would cover 35%, 5% – 10% people with special needs). The PDOs will be achieved through: (i) supporting farmers' productivity and their linkages to markets (ii) facilitating consolidation of agricultural products and cottage processing (iii) facilitating farmers and small and medium businesses clustering and connection to infrastructure network and business services (iv) providing technical assistance and institutional support both to beneficiaries, Federal and State governments in value chain development. The type of value chains to be supported will be aligned towards the achievement of these priority goals in the immediate, short and medium-terms. Six (6) States of Nigeria received a credit from the International Development Association to implement the Agro-Processing, Productivity Enhancement and Livelihood Improvement Support (APPEALS) Project. The States include Cross River, Enugu, Kaduna, Kano, Kogi and Lagos.

The project has five (5) components as follows: Production and Productivity Enhancement; Primary Processing; Value Addition, Post-Harvest Management and Women and Youth Empowerment; Infrastructure Support to Agri-Business Clusters; Technical Assistance, Knowledge Management and Communication and Project Management and Coordination. The Environmental and social safeguards and grievance redress mechanism deals with the issues of safeguards including grievance redress mechanism (GRM).

The project was categorised as category B, whose environmental and social impacts are expected to be minimal, site-specific and manageable to an acceptable level, yet, there is a need to localise the Environmental and Social Management Framework (ESMF) and Resettlement Policy Framework (RPF), which are duo documents prepared under the project. This could be achieved by preparing an action plan assigning responsibilities, monitoring and costs for the implementation of the proposed project activities.
In a bid to fulfil its operation procedures, the World Bank has required the preparation of Environmental and Social Impact Assessment (ESIA) to institute mitigation measures for potential negative impacts of the project and enhance the positive impacts on the environment and Kano State at large, implementation responsibilities, proffer mitigation measures and monitoring framework for the execution of the sub-projects.

Rationale for the Proposed Project

The rationale for the proposed project is the need to use agriculture as an engine of growth to support value chain development in clusters and corridors to promote quick-wins for staple crops of importance, food security and industrial crops for foreign exchange earnings. The concept of Agro-Processing; Productivity Enhancement and Livelihood Improvement Support Project is not a one size fits all but applies to value chain clusters and corridors even in situations where all the necessary infrastructure is not yet in place. The project is thus in line with the Agriculture Promotion Policy, which aims to build on the legacy of the (Agricultural Transformation Agenda) ATA and to support policy thrusts on Food Security, Import Substitution, Job Creation and Economic Diversification. The proposed project aims to improve productivity in Nigeria's agricultural sector by:

(i) improving access to seed capital through grants and matching grants;

(ii) supporting productivity enhancement through the introduction of new technologies and agricultural inputs;

(iii) improving access to infrastructure by supporting investment;

(iv) improving the capacity of produces' cooperative through training and TA, especially for targeted women and youth groups;

(v) facilitating market linkage through, out-growers' schemes; and

(vi) facilitating on-farm value addition by targeting limited value chains and linking farmers to the supply chain.

Purpose of the ESIA

The purpose of the ESIA study is to identify and address possible direct, indirect and cumulative significant adverse environmental and social impacts that are likely to arise from the proposed project for acceptability and sustainability. The primary objective of the ESIA is to facilitate effective decision-making and to ensure that the implementation processes during the execution of the proposed project activities are sustainable. Some of the activities to be carried out during ESIA preparation include; ensuring that agricultural and agro-processing activities are environmentally sound, encouraging community consultation and participation and enhancing social wellbeing. Specifically, the ESIA seeks to provide a clear process including action plans that integrates environmental and social considerations into the APPEALS project.

Methodology for the ESIA Study

The approach and methodology for the ESIA involved the following:

- desktop study; review of design reports and literature reviews;
- reconnaissance visits and site inspections;
- public/stakeholder consultations and involvement;
- data collation, analysis and reporting;
- identification and assessment of environmental and social impacts;
- mitigation measures;
- monitoring and management plan.

Policy, Legal and Administrative Framework

The requirement for an Environmental Assessment is in compliance with the Federal Republic of Nigeria's (FRN) laws and World Bank (WB) operational safeguard policies geared towards achieving sustainable development goals through proper and adequate care for the environment, health and social well-being of her citizens. The policies triggered include:

- Environmental Assessment Policy (OP/BP 4.01)
- Natural Habitats (OP/BP 4.04)
- Pest management (OP/BP 4.09)
- Physical Cultural Resources (PCR) (OP/BP 4.11)
- Involuntary Resettlement (OP/BP 4.12)
- Forests (OP/BP 4.10)

Project Description and Alternatives

The APPEALS Project is earmarked for implementation and intervention in some States of the country of which Kano State is one. The project and its activities are expected to be conducted across the State. Kano State is in the North-Western part of Nigeria between latitude $10^0$33' and $12^0$37' North of the equator and longitudes $7^0$43' and $9^0$35' East of Greenwich. It is bordered to the North West and North East by Katsina and Jigawa States respectively, while to the South and South West with Bauchi and Kaduna States, respectively. The State has a total land area of 20,760 square kilometers with a population of 9, 383,682 people amounting to 6.70% of the nation and a projected population of 12,011,906 people by 2016 based on annual growth rate of 2.5%. The State has fourty four (44) Local Government Areas. Farming is among the major occupation of the people who are predominantly of Hausa/Fulani ethnic origin. Other ethnic groups inhabiting the State include Yoruba, Igbo, Nupe, Kanuri, Tiv, Ebira as well as other ethnic groups from all over the country, West Africa, Middle East and Asia especially Niger, Yemen, Lebanon, China and India. The APPEALS project components and activities entail the following:

This ESIA was prepared for the Agro-Processing, Productivity Enhancement and Livelihood Improvement Support (APPEALS) Project, a project designed to transform the existing large expanse of agricultural land (brown field) into an agricultural production / processing zone. With five project components, the project activities have been divided into three, which include: Agricultural activities, Agro-Processing facilities and infrastructural development as outlined below:

- Agricultural activities: These entail crop and livestock production that would lead to the
    - Development and operation of agricultural fields,
    - Construction of small dams, dykes and weirs such as:
        - Site clearing and/or levelling,
        - Compacting and Blasting,
        - Use of heavy equipment and hazardous materials
        - Material Extraction/quarrying, Slope stability/Excavation, cutting and filling

        - Hazardous materials storage and disposal,
        - Waste management,
        - Construction camps
- Agro-Processing activities: These entail crop and livestock processing and value addition that would lead to
    - Dealing with waste,
    - Treatment technologies for wastes in the farms, from processing sites and markets.
- Development of small and medium scale infrastructures such as
    - Transmission and distribution of electricity,
    - Water supply system,
    - Access Roads
        - Site clearing and/or levelling;
        - Compacting and Blasting;
        - Use of heavy equipment and hazardous materials;
        - Material Extraction, quarrying, Slope stability/Excavation, cutting, and filling;
        - Hazardous materials storage and disposal;
        - Waste management;
        - Construction camps..

Project Components and Activities

S/N	Project Component	Project Activities
1	Production and Productivity Enhancement	• Agricultural activities: Crop and livestock production that involves ○ Support for the development and operation of agricultural fields, ○ acquisition and dissemination of improved agricultural inputs, equipment, machinery ○ development of value chain investment plan ○ facilitation of access and adoption of proven technologies at scale
2	Women and Youths Empowerment, Post-Harvest Management, Value Addition and Processing	• Crop Processing: Crop and Livestock Produce Processing which involves ○ Construction/rehabilitation of aggregation centres; ○ Provision of equipment and machinery for post-harvest handling, storage and quality management, and packaging; ○ Support to market information and agricultural commodity exchange platforms; ○ Facilitate value chains coordination around the aggregation centres
3	Infrastructure Support to agribusiness cluster	• Development of small and medium scale infrastructure: Design, rehabilitation and/or construction development of small and medium scale infrastructures such as ○ transmission and distribution of electricity, ○ Water supply system, ○ Access Roads ○ Provision of last-mile connection to roads networks and utilities (water, energy, transmission lines, gas pipelines, etc).

The Project Alternatives

Results of the analysis of project alternatives indicate that "No Action" alternative: implies that the Agro Processing; Productivity Enhancement and Livelihood Improvement Support Project investment in the proposed area/location does not proceed thereby maintaining the status quo. The status of the environmental resources neither improves nor worsens since the state of the resources is not interfered with at all. However, the implementation of this project has many benefits. The 'No Action Alternative' has various negative and possibly long term impacts to the area which include: (i) the local population continues to suffer from food scarcity and consequently food insecurity due to lack of agricultural produce; (ii) projected reduction in poverty levels through increased incomes could not be achieved (iii) environmental degradation may worsen due to increased deforestation and erosion in the area.

The "Go Ahead Project Alternative, is expected to reduce the operational costs for crops production and processing: create thousands of new jobs: reduce the level of poverty and contribute significantly to Nigeria's economy. The development of Agro Processing; Productivity Enhancement and Livelihood Improvement Support Project will strengthen national food security, improve regional economic growth and generally improve livelihoods in the rural farming communities in the project area through increased household incomes arising from opportunities for secured markets, improved productivity, reduced post-harvest losses and increased employment of the locals. This in turn will reduce the overall level of poverty prevalent in the country.

The advantages of the "go ahead" alternative make it a better option than the "No-Action" alternative; and is therefore strongly recommended.

Baseline Environmental and Social Conditions

The assessment of physical environment of the study area covered general climate and meteorology (including rainfall, temperature, relative humidity and wind characteristics), geology and hydrogeology, air quality and noise levels, surface and underground water; and soil quality assessment. The assessment of the biological environment however covered the flora and fauna distribution within the project area. In this regard, most parameters measured were in conformity with local and international standards and mitigation measures were provided where environment will be affected.

For the socio-economic environment, results of the demographic characteristics revealed that 52% of the farmers fall within 31-50years; 85% of the farmers were male; 94% of them were married; and 65% of the farmers have attained different levels of formal education.

It was also discovered that, there were occurrence cases of Gender Based Violence in the area, where one out of four girls; and one out of ten boys are sexually abused; though most of the cases are not formally reported. Also, The Kano State APPEALS has however developed a functional Grievance Redress Mechanisms which the project is operating.

General Observations from the stakeholders consultations

- There is relative paucity of engagements of women, youths and people living with disabilities in the decision making and economic activities in the communities.
- There is prevalence of gender based violence cases especially in the urban centres which are not disclosed by the community members. This is evident because most of the communities consulted reported that there was no case of GBV, but the *Waraka* centre reports disagree with this, as about 60 cases are reported every month.
- Forest resources, especially local tree species are facing extinction.

The stakeholders consulted comprise:

<u>Project Proponent/Relevant MDAs</u>

- ✓ Kano State APPEALS Coordination Office;
- ✓ Kano State Ministry of Agriculture and Natural Resources;
- ✓ Kano State Ministry of Environment;
- ✓ Kano State Ministry of Women Affairs
- ✓ NESREA
- ✓ Non Governmental Organisations.

<u>Project Beneficiaries for rice, wheat and tomato producers, processors and marketers across the State</u>

- ✓ Danhassan Community, Kura
- ✓ Kura Community, Kura
- ✓ Bunkure Community, Bunkure;
- ✓ Rurum Community, Rano;
- ✓ Rano Community, Rano;
- ✓ Jobe Community, Dawakin Tofa;
- ✓ Kiyawa Community, Bagwai;
- ✓ Bagwai, Bagwai;

- ✓ Shanono Community, Shanono;
- ✓ Rijiya Biyu/ 'Yangurasa Community, Dala;
- ✓ Rijiyar Zaki Community, Ungoggo;
- ✓ Alkamawa Community, Bunkure;
- ✓ Yadakwari Community, Garun Mallam;
- ✓ Albasu Community, Albasu; and
- ✓ Dambatta Community, Dambatta.

Potential Environmental and Social Impact Identification and Evaluation

The potential positive impacts of the proposed Intervention by Kano APPEALS are listed below:

- Improvement of communication
- Connecting rural areas to principal road networks
- Access to markets, transportation of goods and services
- Overall positive impact on the economy
- Facilitation of communication between neighboring rural settlements
- Accessibility to village forests or other areas for land development and use
- Improvement of commercial exchanges
- Access to health and education centres
- Exposure to modern farming techniques
- Human capital development
- Employment generation for local youths
- Increase in agricultural output
- Increase in income of farmer
- Less working time with high productivity
- Enhanced standard of living
- Enhanced Food security in the state and beyond
- Employment generation (supply chain, extension services)
- Enhanced standard of living
- Enhanced Food security
- Employment generation for women and youths.

Negative Environmental and Social Impacts

The potential negative impacts of the project activities in the proposed intervention by Kano State APPEALS with a focus on the three value chains (Rice, Wheat and Tomato) are consistent with category B projects. While the potential negative impacts that could emanate from the project activities include:

- Destruction of vegetation in and near farm access roads
- Increase in poaching and illegal and excessive removal of firewood and wood for rural construction purposes
- Destruction of wildlife habitat
- Impending wildlife movement
- Reduction in biodiversity
- Destruction of local ecological functionalities and displacement of organisms

- Water pollution and negative effect on surrounding ecosystem
- Loss of certain aesthetic values (visual impacts) from destruction of vegetative cover.
- Acceleration of soil erosion due to poor maintenance and drainage of roads
- Poor maintenance of roads could lead to waste of financial capital and human resources
- Increased migration from nearby cities to areas where the projects are sited
- Spread of communicable and other diseases due to labour influx etc.
- Air pollution
- Flooding
- Vegetation loss
- Impending wildlife movement.
- Reduction in biodiversity
- Destruction of local ecological functionalities and displacement of organisms.
- Groundwater pollution and negative effect on surrounding ecosystem
- Generation of both solid wastes and wastewater.
- Transmission of HIV/AIDs and other communicable diseases like *tetanus*
- Harvesting and Postharvest handling of outputs.
- Fire risks.

Mitigation Measures for Significant Potential Adverse Impacts

The application of the mitigation measures in general is expected to reduce major and moderate impacts to minor or negligible impacts that may not require further mitigation. The recommended mitigation measure for the potential environmental and social impact for the rice, wheat and tomato value chains are presented below:

Mitigation Measures for Significant Potential Adverse Impacts of construction and maintenance of farm access roads and small dams

	Activities	Environmental and social impact	Key Receptors	Mitigation measures	Monitoring	Responsibility
1.	The potential air quality and noise impact will include					
		➢ Increase in noise and dust due to vehicles movement and construction activities ➢ Gaseous emissions from vehicles plying the roads. ➢ Health and safety issues of both the workers, residents and the road users due to vehicular speed and introduction of harmful gases	Flora, fauna, soil	➢ Speed breaks should be introduced at specific points. ➢ Trees should be planted within few metres distance between road and residential areas to reduce noise. ➢ Sprinkle water during construction. ➢ Road signs indicating the speed limit should be erected at sections of the road. ➢ The use of rickety vehicles should not be allowed	➢ Regular check for adherence to safety concerns. ➢ Ensure that all areas have trees planted along the road corridors. ➢ Ensure that road signs are placed along the road corridors. ➢ Ensure that speed limits are strictly adhered to. ➢ Ensure that vehicles are in good condition so as not to pollute the environment when driving along the roads.	Contractor, ESS, RIE, CBDO, COO, CIGs

2.	Water quality impact will include					
		➢ Oil and grease droplets might pollute surface and groundwater. ➢ Effluent generated from mixture of water with chemical lubricants will increase COD and SS which will impact adversely on the water quality of the area. ➢ Solid wastes generated and dumped around the area may sip and contaminate the groundwater.	Soil, water, workers, motorists, Public	➢ Chemical wastes from vehicles should be handled carefully and dumped properly; ➢ Motorists should be educated on the dangers of indiscriminate dumping of chemical wastes close to farmlands ➢ Motorists and road users should use approved mechanic villages for vehicular repairs. ➢ Ensure all construction equipment, machinery and vehicles are clean ➢ Ensure regular checks and maintenance of vehicles and machinery to avoid oil spills. ➢ Ensure proper waste disposal strategies.	➢ Ensure that proper waste management practices are adhered to. ➢ Adherence to the principles of safe and clean environment should be taken paramount. ➢ Road users should be made to observe the mitigation measures.	Motorist, Contractor, ESS, RIE, CBDO, COO, CIGs

3.	Ecology and biodiversity impact will include.					
		➢ Contamination of surface water and groundwater from chemical effluents. ➢ Poor and untidy environment. ➢ Risks and impairment of the ecosystem.	Surface water, groundwater, Community members	➢ Where possible, the clearing of vegetation, particularly of indigenous trees needs to be avoided as much as possible during construction, and the clearing needs to be carried out only where necessary ➢ Trees should be planted in the open farm access roads. ➢ Official waste dump sites should be established and waste management operators should be contacted on the prompt clearing of waste deposited. ➢ Where clearing is	➢ Regular environmental assessment with interest on the ecological biodiversity. ➢ Consistent checks on the management of waste.	Contractor, ESS, RIE, CBDO, COO, CIGs

				done, land should be landscaped and reclaimed by planting more trees and other forms of vegetation. ➢ Community members should be advised to use appropriate waste dump sites and to stop indiscriminate waste dumping.		
4.	Wildlife and forestry impact will include					
		➢ Migration to a new habitat where it is possible to adapt. ➢ Loss of original forest cover. ➢ Evolvement of invasive plant life. ➢ Reduction in the population of micro fauna	Flora, Fauna	➢ Massive tree planting around the area. ➢ Regular checks on the invasive plants. ➢ The community should be engaged on the need to keep to all environmental and safety regulations.	➢ Consistent checks on the adherence to safety regulations. ➢ Regular cleaning and clearing of the environment. ➢ Ensure massive tree planting.	Contractor, ESS, COO, CBDO, CIGs

5.	Socioeconomic and community health impact will include					
		➢ Exposure to danger in form of road accidents. ➢ Adverse adjustment to vehicular traffic and noise. ➢ Health implication to children from petroleum effluents. ➢ Transmission of STIs/HIV/AIDS and other communicable diseases, like Covid-19 due to free-flow and high influx of labour; *tetanus* due to cuts with metal objects particularly during the construction and operation phases. ➢ Gender Based Violence cases due to labour influx	Workers, Farmers, neighbouring community	➢ Road signs and symbols indicating designated speed should be erected. ➢ Introduction of speed breakers ➢ Proper cleaning and clearing of petroleum products. ➢ Sensitize workers and community members on the ways of contracting HIV/AIDS through collaboration with NGOs, CBOs available in the State. ➢ Empower the testing centres for STIs/HIV/AIDS within the health facilities in the immediate communities. ➢ Ensure that Covid-19 protocols as provided by the Presidential Tasks	➢ Consistent checks on the adherence to safety regulations. ➢ Regular check on the adherence to traffic regulations by road users.	Contractor, ESS, RIE, COO, CBDO, CIGs

				Force and other health agencies in the construction sites and camps. ➢ Traditional leaders in the communities should be engaged to sensitize the workers on the values and norms of the people in the area. ➢ Contractor should provide labour influx management plan to APPEALS for approval. ➢ The community should be engaged on the need to keep to all environmental and safety regulations.		

Mitigation Measures for Significant Potential Adverse Impacts for Rice Production

S/N	Activities	Environmental and social impact	Key Receptors	Mitigation measures	Monitoring	Responsibility
1.	Pre-cropping activities	• Poor site selection (poor soil and water quality). • Interference on biodiversity conservation (changes in flora and fauna) • Deterioration from burning of biomass of cleared forest and addition of carbon into the atmosphere • Increased runoff from land clearing and maximum tillage leading to soil quality and nutrient loss. • Loss of valuable natural plant species that are of medicinal value to the neighboring communities. • Removal of the topsoil from cuttings of trees and shrubs • Oil leakages from vehicles impacting surface water negatively. • Risk of work-site accidents from the improper handling of machines and equipment. • Noise and vibration.	Farmers, Community members	• Selection of a good site for cropping activities • Avoid environmentally sensitive sites and unnecessary exposure to sensitive habitat • Consult Forestry Department in the selection and use of such sites • Avoid burning of biomass as much as possible and the use of fire only in situations where this is least environmentally damaging. • Adopt Minimum tillage practices • Create natural plant protection zone. • Ensure that the trees and shrubs are cut down only where necessary • Regular maintenance of vehicles. • Use PPE and machine manuals.	Soil and water quality tests to be compared with post cropping levels. Also, ensure trees are planted around the farms.	Farmer, ESS, PES, RIE, CBDO, Facilitator Rice, CIGs

		• Dust and gas emissions from the discharge of particulates that may increase respiratory diseases around the sub-project vicinity		• Use of noise protection devices. • Use goggles and face masks during activities		
2.	Production level	• Surface and ground water contamination through the excessive application of fertilizer. • Extreme weather conditions such as heavy rains. • Pests emergence	Surface water, groundwater, Soil, Crop	• Minimum use of fertilizer and introduction of organic fertilizers. • Adherence to Cropping calendar to suit weather. • Adhere to Integrated pest management plan.	Water quality tests, Establish cropping calendar, Provision of integrated Pest Management Plan	Farmer, ESS, PES, RIE, CBDO, Facilitator Rice, CIGs
3.	Farm operation and management	• Disposal of Agro-chemical containers • Human health deterioration through the pollution of water sources from production wastes and residues	Farmers, Public, Surface water, groundwater, Soil	• Proper disposal of Agro-chemical containers • Training on agro-chemical containers handling • Pipe-borne water should be provided in the long term to all the farmers	Trainings on disposal of agrochemical containers. Provision of Pipe-borne water	Farmer, ESS, PES, RIE, CBDO, Facilitator Rice, CIGs
4.	Harvesting and post-harvest handling	• Accidents when using machines and injuries caused by reptiles • Losses due to pest attack in the stores • Contamination of produce with foreign materials during post-harvest operations (Open drying of paddy).	Farmers, Workers, Paddy	• Use PPE during harvest and postharvest activities. • Good practices on harvest and post-harvest handling. • Use of simple machines for harvesting and post harvest handling. • Integrated Pest Management protocols should be adhered to during storage of paddy and processed rice.	Training and adoption of good practices of harvest and post-harvest handling. Innovating simple and cost effective machines like threshers for	Farmer, ESS, PES, RIE, CBDO, APS, COO, Facilitator Rice, CIGs

				• Drying should be in protected, enclosed and hygienic stalls. • Mechanical dryers should be used.	harvesting and post harvest handling. Encourage the fabrication of simple and affordable mechanical dryers.	
5.	Marketing	• Accidents and injuries during loading and off-loading. • Food wastes and losses during transportation. • Food wastes and losses during storage.	Marketers, Workers, transporters, Public	• Use of supporting equipment for loading and off-loading. • Ensure proper packaging during transportation. • Ensure provision of adequate storage facilities.	• Ensure that farmers and transporters Use standard packaging materials, means of transportation and storage facilities.	Farmer/ Marketer, ESS, PES, RIE, CBDO, APS, Facilitator Rice, CIGs

Mitigation Measures for Significant Potential Adverse Impacts for Rice Processing

S/N	Activities	Environmental and social impact	Key Receptors	Mitigation measures	Monitoring	Responsibility
	Rice Milling	• Procurement of poor-quality machines and equipment • Increase in amounts of dust and exhaust fumes from vehicle movement on the site • Generation of solid wastes such as husks. • Burning of rice husks in the milling plants	Millers, Marketers, Public	• Ensure all procurement, construction and installation activities follow approved standard. • Use a good de-stoner machine. • Sprinkling of water to minimize dusts. • Adhere to waste management plan protocols. • Promote the use of husks for livestock feeds and	• Check the environment for the status of the wastes • Monitor the use of Personal protective equipment in plant • Ensure compliance to standard	Processor, ESS, APS, CBDO, RIE, WYEL, Facilitator Rice, CIGs

		• Risk of injury and accidents from operating processing machines. • Product contamination due to improper sanitation and hygiene in plant		other uses such as source of energy. • Use of Personal Protective Equipment including goggles and face masks during activities • Use of noise protection devices. • Use standard sanitation and hygiene protocols	protocols in the plant . • Enhance innovation of local milling equipment. • Train millers on the use of milling equipment.	
	Parboiling	• Generation of solid waste and wastewater. • Excessive use of firewood as source of energy. • Use of chemical detergents in parboiling. • Drying in open spaces, where people and animals trample. • Product contamination due to improper sanitation and hygiene during drying of parboiled rice.	Parboilers, Marketers, Public	• Proper waste management • Use of alternative energy sources in parboiling, such as liquefied natural gas and husks. • Sensitize processors on the adverse effects of use of detergents and other harmful chemicals during parboiling. • Use of standard drying facilities in enclosed sites. • Plant trees around the processing plant.	• Ensure the implementation of waste management plan • Ensure the use of proper drying facilities. • Ensure planting of trees.	Processor, ESS, APS, CBDO, RIE , WYEL, Facilitator Rice, CIGs

Mitigation Measures for Significant Potential Adverse Impacts for Wheat Production

S/n	Activities	Environmental and social impact	Key Receptors	Mitigation measures	Monitoring	Responsibility
1.	Pre-cropping activities	• Poor site selection (poor soil and water quality). • Interference on biodiversity conservation (changes in flora and fauna) • Deterioration from burning of biomass of cleared forest and addition of carbon into the atmosphere • Increased runoff from land clearing and maximum tillage leading to soil quality and nutrient loss. • Loss of valuable natural plant species that are of medicinal value to the neighboring communities. • Removal of the topsoil from cuttings of trees and shrubs • Oil leakages from vehicles impacting on surface water negatively. • Risk of work-site accidents from the improper handling of machines and equipment. • Dust and gas emissions from the discharge of particulates that may increase respiratory diseases around the sub-project vicinity	Farmers, Community members, Air, Soil, flora, fauna	• Selection of a good site for cropping activities • Avoid environmentally sensitive sites and unnecessary exposure to sensitive habitat • Consult Forestry Department in the selection and use of such sites. • Avoid burning of biomass as much as possible and the use of fire only in situations where this is least environmental damaging. • Adopt Minimum tillage • Create natural plant protection zone. • Ensure that the trees and shrub are cut down only where necessary. • Plant trees around the area. • Regular maintenance of vehicles. • Use of PPE and machine manuals. • Use of noise protection equipment . • Ensure tree planting.	Soil and water quality tests to be compared with post cropping levels. Also ensure that trees are planted around the farms.	Farmer, ESS, PES, RIE, CBDO, Facilitator Wheat, CIGs

2.	Production level	• Surface water contamination through the excessive application of fertilizer. • Extreme weather conditions such as heavy rains. • Pest emergence.	Surface water, underground water, Crop	• Minimum use of fertilizer and introduction of organic fertilizers. • Adherence to Cropping calendar to suit weather. • Use Integrated pest management plan.	Water quality tests Establish cropping calendar. Prepare an IPM plan	Farmer, ESS, PES, RIE, WYEL, CBDO, Facilitator Wheat, CIGs
3.	Farm operation and management	• Disposal of Agro-chemical containers. • Human health through the pollution of water sources from production wastes and residues	Soil, Surface water, Farmer, Community members	• Proper disposal of Agro-chemical containers. • Training on agro-chemical containers handling. • Pipe-borne water should be provided in the long term to all the farmers.	• Trainings on disposal of agrochemical containers. • Provision of Pipe-borne water	Farmer, ESS, PES, RIE, WYEL, CBDO, Facilitator Wheat, CIGs
4.	Harvest and post-harvest handling	• Accidents and injuries. • Food losses • Contamination of produce with foreign materials during post-harvest operations. .	Farmer, Workers	• Good practices on harvest and post-harvest handling. • Use of simple machines for harvesting and post harvest handling.	• Training and adoption of good practices of harvest and post-harvest handling. • Innovating simple and cost effective machines for harvesting and post harvest handling.	Farmer, ESS, PES, RIE, WYEL, CBDO, APS, Facilitator Wheat, CIGs

5.	Marketing	• Accidents and injuries during loading and off-loading. • Food wastes and losses during transportation. • Food wastes and losses during storage.	Farmer, Transporter, Marketer, Workers	• Use of supporting equipment for loading and off-loading. • Ensure proper packaging during transportation. • Ensure adequate storage facilities are provided and used to reduce wastes.	• Ensure that farmers and transporters use standard packaging materials and means of transportation • Ensure the use of standard procedure for processing paddy.	Farmer/ Marketer, ESS, RIE, WYEL, CBDO, APS, Facilitator Wheat, CIGs

Mitigation Measures for Significant Potential Adverse Impacts for Wheat Processing

S/n	Activities	Environmental and social impact	Key Receptors	Mitigation measures	Monitoring	Responsibility
1.	Wheat Milling	• Procurement of poor-quality machines and equipment. • Increase in amounts of dust and exhaust fumes from vehicle movement and milling machines. • Noise and vibration. • Generation of solid wastes. • Risk of injury and accidents from operating processing machines. • Product contamination due to improper sanitation and hygiene in plant	Millers, Marketers, Public	• Ensure all procurement, construction and installation activities followed approved standard. • Sprinkling of water to minimize dusts. • Ensure proper handling and disposal f solid waste generated. • Use of Personal Protective Equipment including goggles and face masks during activities • Use of noise protection devices.	• Check the environment for the status of the wastes. • Ensure the provision of wastes disposal sites for the millers. • Monitor the use of Personal protective equipment in plant	Processor, ESS, APS, CBDO, RIE, WYEL, Facilitator Wheat, CIGs

				• Use standard sanitation and hygiene protocols	• Ensure compliance to standard protocols in the plant. • Enhance innovation of local milling equipment. • Train millers on the use of milling equipment.	
2.	Gurasa Production	• Generation of solid wastes and wastewater. • Product contamination due to improper sanitation and hygiene in processing plant. • Improper inclusion of food additives and related chemicals in the finished product. • Increased use of firewood for energy. • Inadequate technology use in making *gurasa*. • Direct contact to heat source causing dehydration and physical burns.	Gurasa makers, Neighbouring communities, Gurasa marketers	• Proper waste management • Use of standard protocols for sanitation and hygiene in plants • Ensure the use of standard food processing protocols approved by NAFDAC • Promote the use of alternative energy like Liquefied Natural Gas. • Plant trees around the processing areas. • Provide a modern oven for *gurasa* making. • Consistent use ofPPE. • Frequent medical checkups at least one in six months.	Ensure compliance with waste management Plan. Ensure adherence to standard food processing protocols in plant. Ensure sensitization on the use of alternative energy sorce andtree planting..	Processor, ESS, APS, RIE , CBDO, WYEL, COO, Facilitator Wheat, CIGs

		• Risk of fire incidence		• Provide fire extinguishers in the plants.	Encourage fabrication of *gurasa* making oven. Ensure that gurasa makers undergo medical checkups within the stipulated time. Training on the use of fire extinguishers.	

Mitigation Measures for Significant Potential Adverse Impacts for Tomato Production

S/N	Activities	Environmental and social impact		Mitigation measures	Monitoring	Responsibility
1.	Pre-cropping activities	• Poor site selection (poor soil and water quality). • Interference on biodiversity conservation (changes in flora and fauna) • Cultivation of single crop may alteration of natural vegetation due to cultivation of single crop • Deterioration from burning of	Farmers, Community members, Air, Soil, flora, fauna	• Selection of a good site for cropping activities • Avoid environmentally sensitive sites and unnecessary exposure to sensitive habitat • Consult Forestry Department in the selection and use of such sites • Avoid burning of	Soil and water quality tests to be compared with post cropping levels. Ensure also that tress are planted in the areas.	Farmer, ESS, PES, RIE, WYEL, CBDO, COO, Facilitator Tomato, CIGs

		biomass of cleared forest and addition of carbon into the atmosphere • Increased runoff from land clearing and maximum tillage leading to soil quality and nutrient loss. • Loss of valuable natural plant species that are of medicinal value to the neighboring communities. • Removal of the topsoil from cuttings of trees and shrubs • Oil leakages from vehicles impacting surface water negatively. • Risk of work-site accidents from the improper handling of machines and equipment. • Dust and gas emissions from the discharge of particulates that may increase respiratory disease around the sub-project vicinity		biomass as much as and the use of fire only in situations where this is least environmental damaging. • Adopt Minimum tillage • Create natural plant protection zone. • Ensure that the trees and shrub are cut down only where necessary • Regular maintenance of vehicles. • Use of PPE and machine manuals. • Use of noise protection. • Ensure trees are planted in the area.		
2.	Production level	• Surface water contamination through the excessive application of fertilizer. • Extreme weather conditions such as heavy rains. • Pests emergence	Surface water, underground water, Crop	• Minimum use of fertilizer and introduction of organic fertilizers. • Establish cropping calendar • Integrated pest management plan.	• Water quality tests • Adherence to Cropping calendar to suit weather.	Farmer, ESS, PES, RIE, WYEL, CBDO, COO, Facilitator Tomato, CIGs

3.	Farm operation and management	• Disposal of Agro-chemicals container • Human health through the pollution of water sources from production wastes and residues	Soil, Surface water, Farmer, Community members	• Proper disposal of Agro-chemical containers. • Training on agro-chemical containers handling. • Pipe-borne water should be provided in the long term to all the farmers	• Trainings on disposal of agrochemical containers. • Check for the availability of Pipe-borne water	Farmer, ESS, PES, RIE, WYEL, CBDO, COO, Facilitator Tomato, CIGs
4.	Harvest and post-harvest handling	• Accidents and injuries. • On-farm losses of tomato fruits.		• Good safety operation practices during harvest and post-harvest handlings. • Use simple tomato harvesting and collection implement.	• Ensure adherence to safety protocols. • Ensure innovation of simple tomato harvesting and collection implements.	Farmer, ESS, APS, RIE, WYEL, CBDO, COO, Facilitator Tomato, CIGs
5.	Marketing	• Accidents and injuries during loading and off-loading. • Contamination and deterioration of fruits due to excessive use of traditional woven baskets. • Destruction of fruits by pests. • Fruit wastes and losses during transportation	•	• Use of proper method and appropriate aid tools for loading and off-loading. • Provide adequate storage facilities in aggregation centres. • Use of Returnable Plastic Crates. • Ensure the use of IPM Plan. • Use of appropriate means of transportation.	Ensure the use of proper method and aid tools.	Farmer/ Marketer, ESS, APS, RIE, WYEL, CBDO, COO, Facilitator Tomato, CIGs

Mitigation Measures for Significant Potential Adverse Impacts for Tomato Processing

S/N	Activities	Environmental and social impact	Key Receptors	Mitigation measures	Monitoring	Responsibility
	Production of dried tomato	• Generation of solid wastes and wastewater. • Product contamination due to improper sanitation and hygiene during drying of sliced tomatoes.	Farmers, Processors, Marketers	• Proper waste management • Use of standard drying facilities	• Ensure the implementation of waste management plan • Ensure the use of proper drying facilities	Processor, ESS, APS, RIE , CBDO, WYEL, Facilitator Tomato, CIGs
	Production of tomato Paste	• Improper site selection process. • Procurement of poor-quality machines and equipment • Increase in amounts of dust and exhaust fumes from vehicle movement on the site • Generation of solid wastes and wastewater. • Product contamination due to improper sanitation and hygiene in processing plant • Improper inclusion of food additives and related chemicals in the finished product.	Farmers, Processors, Marketers	• Ensure proper site selection procedures. • Ensure all procurement, construction and installation activities follow approved standard. • Ensure the innovation of simple tomato processing machines. • Sprinkling of water to minimize dust • Proper waste management • Use of standard protocols for sanitation and hygiene in plants • Ensure the use of standard food processing protocols approved by NAFDAC. • Ensure that trees are planted in the area.	• Ensure the suitability of the site for tomato paste production. • Ensure the implementation of waste management plan • Provide simple tomato processing technology. • Ensure adherence to standard protocols. • Ensure that IPM Plan is strictly adhered to. • Sensitize the processors on the need to plant trees around the plant.	Processor, ESS, APS, RIE , CBDO, WYEL, Facilitator Tomato, CIGs

Institutional Arrangements and Responsibilities

This Environmental and Social Management Plan (ESMP) contains the institutional arrangements and responsibilities, for the implementation of the environmental and social safeguard measures. The roles and responsibilities of the institutions in the implementation of the ESMP are provided as:

Project Management Unit

The Federal Ministry of Agriculture and Rural Development (FMARD) has the overall responsibility for executing the Project.

At the Federal level, the NCO coordinates the project activities on behalf of the FMARD, who has the overall responsibility for the execution of the project. The NCO will play the role of Project Implementation Units and will be responsible for implementing the day-to-day project activities, coordinate the work of the different actors at the federal level, prepare periodic reports and provide support to all the SCOs. The NSC will be responsible for the overall project oversight, review project monitoring reports on advances in project implementation, approval of Annual Work Plans and budget at the NCO level, and reviewing progress of the project implementation across the participating states.

At the State level, Kano State Coordination Office has the responsibility of coordinating and facilitating the project activities through its staff. It is also responsible for preparing monitoring reports, coordinate work with the NCO, prepare the annual work plans and budgets, facilitate the work and provide the periodic reports to SSC and NCO.

Oversight policy and strategic orientation functions will be performed by the State Steering Committee (SSC), chaired by the Deputy Governor. The composition of the SSC includes but not limited to relevant Commissioners and Permanent Secretaries, having the SCO as the secretariat.

Environmental and Social Safeguards Unit

To ensure sustainability in all the Agro-Processing; Productivity Enhancement and Livelihood Improvement Support project and sub-project activities; an environmental and social development safeguards unit has been formed at both the NCO and SCOs which includes the environmental and social development safeguards specialist/officer who reports directly to the National Project Coordinator or State Project Coordinator as the case may be.

Environmental and Social Management Plan

The environmental and social management plan prepared for this study is project-based. The ESMP highlighted the impacts vis-à-vis the mitigation, the monitoring approach and the agency responsible for apt follow-up of the provisions. The ESMP contains the recommendations for the development of a number of detailed management plans and procedures that lay out the specifications for compliance with specific environmental and social elements. Some of the key plans are listed below.

- Flora and Fauna Management Plan
- Waste Management Plan;
- Employment, Training, and Awareness Management Plan
- Water Management Plan;
- Vegetation Clearing and Biomass Management Plan;

- Air quality Management Plan;
- Chemical Management Plan;
- Emergency Response and Incident Management Plan.
- Traffic and Vehicle Management Plan;
- Social Investment Plan;
- Health, Safety and Security Management Plan;
- Stakeholders Engagement Plan;
- Site Closure and Restoration Plan;
- Labour Influx Management Plan;
- Cultural heritage Plan;
- Occupational Health and Safety Policy.

ESMP Costing and Cost Analysis

The cost analysis illustrated here is structured to ensure that each of the identified mitigation measures is successfully and expertly implemented. It is designed exclusively for each of the activities identified for each of the activities and value chains in the Kano APPEALS intervention project. Hence, it covers the Agricultural productivity, Agro-Processing and Small infrastructure activities mitigation measures. In addition, the cost is designed for a global spread across the stated measures. The synoptic details of the ESMP costing for the Kano APPEALS intervention project with estimation in U.S. Dollar is presented, thus:

Cost Analysis of the Proposed Project ESMP Implementation

S/N	ESMP Activities (Monitoring)	Cost Estimates ($)
1	**Rice**	**19,000**
2	**Wheat**	**18,300**
3	**Tomato**	**17,500**
	Total for Impact Mitigation Monitoring	**54,800**
4	***Institutional Capacity Reinforcement Programme***	
	Kano APPEALS SCO Capacity Reinforcement	5,400
	Trainings for Farmer Cooperatives	7,600
	Total for Institutional Capacity	**13,000**
Total for Mitigation Monitoring		**67,800**
	10% Contingency	6,780
Grand Total		**74,580**

ESIA Disclosures

After a review and clearance by the World Bank, the ESIA will be disclosed at the FMEnv, SME and the host LGA offices as well as at the World Bank website. The purpose of these disclosures will be to inform stakeholders about the project activities, impacts, anticipated and proposed environmental management actions as well as to obtain the certificate of conformity from the Federal Ministry of Environment.

Conclusion

The findings of the ESIA indicate that there are no issues of major significance that could not be mitigated such that the proposed project was not acceptable from an environmental and socio-economic perspectives. The only residual negative impact with significance ratings of moderate is the impact on soils and geology during construction, however, the severity of these impacts could be reduced to acceptable levels through the mitigations identified in the report.

A number of positive impacts were identified; the impacts to the national economy and local employment were assessed to be of major significance post-mitigation. The positive impacts of the Project on employment and economic impacts are considered to remain of major significance with enhancement measures. Positive impacts on infrastructure are also considered to be moderate positive.

In consideration of the above, we therefore recommend that the ESIA of Kano APPEALS Project be approved and issued ESIA permit. The mitigation measures that have been proffered shall be adequately implemented in accordance with the ESMP and in compliance with the EIA Act and the World Bank environmental and social safeguard policies.

The purpose of the Environmental and Social Impact Assessment (ESIA) study is to identify and address possible direct, indirect and cumulative significant adverse environmental and social impacts that are likely to arise from the proposed project for acceptability and sustainability. The primary objective of the ESIA is to facilitate effective decision-making and to ensure that the implementation processes during the execution of the proposed project activities are sustainable. It is in line with the afore mentioned purpose, that this ESIA for the proposed Kano APPEALS Project (with reference to the priority value chains of rice, wheat and tomato) was undertaken to provide detailed information for decision-making to contribute to environmentally sound and sustainable development.

The positive impacts identified include improvement on communication, access to markets, improvement of commercial exchanges, access to education and health centres, exposure to modern farming techniques, employment generation and overall improvement of local and national economy. The impacts to the national economy and local employment were assessed to be of major significance post-mitigation. The positive impacts of the Project on employment and economy are considered to remain as major significance with enhancement measures. Positive impacts on infrastructure were also considered to be moderate positive during operation.

The identified adverse impacts of the proposed project include; air pollution, soil, sediment, groundwater and surface water contamination from accidental/ routine discharges of effluent, workplace accidents, improper waste management has been identified. Consequently, cost-effective mitigation/ amelioration measures have been designed to ensure that these impacts are prevented, reduced or controlled to as low as reasonably practicable in order to ensure conservation of biodiversity in the area and enhance continuous compliance with environmental standards and requirements in Nigeria. It is understood that the project will result in substantial social and economic benefit for Nigeria. The ESMP developed would ensure the plans and procedures for

managing the significant impacts of the project are maintained throughout the project implementation. It should be stressed here that holistic and religious implementation of the mitigation measure ; and monitoring, the negative impacts would be avoided or reduced to the acceptable limit, to ensure the sustainability of the project objectives.

It could therefore be finally concluded that, from the outcomes of the ESIA undertaken, all the environmental and social issues identified can be mitigated and managed through the ESMP presented in the report. Therefore, we recommend that the ESIA of Kano APPEALS Project be approved and issued ESIA permit. The mitigation measures that have been proffered shall be adequately implemented in accordance with the ESMP and in compliance with the ESIA Act and the World Bank environmental and social safeguard policies

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Agro-Processing, Productivity Enhancement and Livelihood Improvement Support (APPEALS) Project is a World Bank assisted project prepared by the Federal Ministry of Agriculture and Rural Development. The Project aims at transitioning of small (farming 1-5ha) and medium farmers' (farming 5-10 ha) production system to market oriented agriculture. The project builds on ATA/CADP and planned to support policy on: Food Security, Local Production, Job Creation and Economic Diversification. The PDOs of the project are: Increase in productivity of agricultural produce of the priority value chains by the project supported farmers, Increase of processed output of the priority value chains by project beneficiaries and number of beneficiaries supported by the Project (of which women and youths would cover 35%, 5% – 10% people with special needs).

Kano State is one of the six (6) States of Nigeria that, through the Federal Government of Nigeria received a credit from the International Development Association (herein referred to as IDA Bank) to implement the APPEALS Project.

The implantation of the project is premised on the fact that, although the country has a major comparative advantage in the agricultural sector, the production system has not been developed towards achieving a major value addition or processing. As a result of this, Nigeria has remained mainly staple crops producer country. The locomotive role that could have been played by the development of value addition alongside the enhancement of productivity, has, therefore, not been realized. Nigeria's low agricultural productivity can be attributed to a number of factors. These factors are: little and untimely access to inputs; lack of seed funds for establishing agro-processing plants by producer cooperatives; lack of access to supportive infrastructure; challenging business environment; limited access to markets; low level of improved technology adoption; weak quality control mechanism which makes supplier including the government unable to deliver quality inputs to farmers; and low capacity at all levels.

The project will address some of these challenges by improving access to seed capital through grants and matching grants; introduce new technologies and agricultural inputs; improve access to infrastructure by supporting investment; enhance the capacity of producer cooperatives through training and technical assistance, especially for targeted women and youth groups; facilitate market linkages through business alliance and out-growers schemes; and support on-farm value addition through targeting a limited number of value chains and linking farmers to the supply chain.

Overall, the project will help the Federal Government in achieving its priority goals, namely exploit export potential, improve food security, and enhance livelihoods. The value chains to be supported will be aligned towards the achievement of these priority goals in the immediate, short and medium -terms.

The APPEALS project covers five states (Cross River, Enugu, Kaduna, Kano and Lagos) under CADP, and Kogi State which was the basis for the preparation of this project in its early design. The participating states and indicative priority value chains are shown in Table 1.1. Additional states may, however, be added during the project implementation depending on funding availability, states readiness to participate and potential for expanding agribusiness clusters and corridors in the prospective participating states.

Table 1.1: Participating States and their Priority Value Chains

S/N	State	Value Chain		
		Food Security	**Export Potential**	**Livelihood**
1	Cross River	Rice	Cocoa	Poultry
2	Enugu	Rice	Cashew	Poultry
3	Kaduna	Maize	Ginger	Dairy
4	Kano	Rice	Wheat	Tomato
5	Kogi	Cassava	Cashew	Rice
6	Lagos	Rice	Aquaculture	Poultry

It is expected that the project will enhance agricultural productivity of small and medium scale farmers and improve the value addition along the priority value chains in the participating states. The Project Development Objectives (PDOs) will be achieved through supporting farmers' productivity and their linkage to markets, facilitating the consolidation of agricultural products and cottage processing, facilitating farmers and small and medium businesses clustering and connection to infrastructure network and business services, providing Technical Assistance (TA) and institutional support both to beneficiaries, Federal and State governments in value chain development. Increased productivity, production, and improving processing and marketing of the targeted value chains are, by extension, expected to foster job creation along the value chain. The project support will, in addition, focus on the priority value chains identified in the Green Alternative - the Agricultural Promotion Policy (APP-2016-2020), through facilitating business alliances, promotion of greater farmers-agri-business linkages and support to critical infrastructure in the value chain development. The activities to be carried out under the project triggered the World Bank Safeguard Policies including OP/BP 4.01 on Environmental Assessment (EA), Natural Habitats (OP/BP 4.04),

Pest Management (OP/BP 4.09), Physical Cultural Resources (OP/BP 4.11), Involuntary Resettlement (OP/BP 4.12)and Forests (OP/BP 4.36)

The project has five (5) components as follows: Production and Productivity Enhancement; Primary Processing; Value Addition, Post-Harvest Management and Women and Youth Empowerment; Infrastructure Support to Agri-Business Clusters; Technical Assistance, Knowledge Management and Communication and Project Management and Coordination. Environmental and social safeguards and grievance redress mechanism deals with the issues of safeguards including Grievance Redress Mechanism (GRM).

The environmental and social safeguards concerns are to be addressed through two national instruments already prepared under the project: An Environmental and Social Management Framework (ESMF) and a Resettlement Policy Framework (RPF). These framework instruments need to be translated into specific cost, measurable and monitorable actions for specific intervention sites through the preparation of site-specific management and action plans.

In general, the ESMF specifies the procedures to be applied in preparing, approving and implementing (i) environmental and social impacts assessments (ESIAs, or alternately either SA or EA) and/or (2) Environmental/Social Management Plans (ESMPs, or alternately both an EMP and SMP) for activities at the State level.

The RPF applies when land acquisition leads to the temporary or permanent physical displacement of persons, and/or loss of shelter, and /or loss of livelihoods and/or loss, denial or restriction of access to economic resources due to project activities. It sets out the resettlement and compensation principles, organizational arrangements and design criteria to be applied in order to meet the needs of project-affected persons and specify the contents of a Resettlement Action Plan (RAP) for each package of investments.

The *ESIA* is site-specific and consists of well-documented set of mitigation, monitoring and institutional actions to be taken before and during the implementation of projects to eliminate adverse environmental and social impacts, offset them or reduce them to acceptable levels. The ESIA contains an ESMP which documents the measures required to implement these actions and address the adequacy of the monitoring and institutional arrangements for the project sites. The ESIA report shall contain studies on the Baseline Inventory, Stakeholders Identification and Consultation, Labour influx and Gender Issues, Citizens Engagement, Gender Based Violence Issues and Grievance Redress Mechanism.

The *GBV/SEA* involves the mainstreaming of Gender Based Violence and Sexual Exploitation and Abuse risks under the project activities.

1.2 Rationale for the Proposed Project

The rationale for the proposed project is the need to use agriculture as an engine of growth to support value chain development in clusters and corridors to promote quick-wins for staple crops of importance, food security and industrial crops for foreign exchange earnings. The

concept of Agro-Processing; Productivity Enhancement and Livelihood Improvement Support Project is not a one size fits all but applies to value chain clusters and corridors even in situations where all the necessary infrastructure are not yet in place. The project is thus in line with the Agriculture Promotion Policy, which aims to build on the legacy of the Agricultural Transformation Agenda `and to support policy thrusts on Food Security, Import Substitution, Job Creation and Economic Diversification. The proposed project aims to improve productivity in Nigeria's agricultural sector by:

i. improving access to seed capital through grants and matching grants;

ii. supporting productivity enhancement through the introduction of new technologies and agricultural inputs;

iii. improving access to infrastructure by supporting investment;

iv. improving the capacity of producer cooperatives through training and TA, especially for targeted women and youth groups;

v. facilitating market linkages through out-growers' schemes; and

vi. facilitating on-farm value addition by targeting limited value chains and linking farmers to the supply chain.

1.3 Purpose of the ESIA

The purpose of the ESIA study is to identify and address possible direct, indirect and cumulative significant adverse environmental and social impacts that are likely to arise from the proposed project for acceptability and sustainability. The primary objective of the ESIA is to facilitate effective decision-making and to ensure that the implementation processes during the execution of the proposed project activities are sustainable. Some of the activities to be carried out during ESIA preparation include; ensuring that agricultural and agro-processing activities are environmentally sound, encouraging community consultation and participation and enhancing social wellbeing. Specifically, the ESIA seeks to provide a clear process including action plans that integrate environmental and social considerations into the APPEALS project.

1.4 Objectives and Scope of the Consultancy

The objective of the consulting services is to prepare an environmental and social impact assessment (ESIA) for the Kano State APPEALS on priority value chains of rice, wheat and tomato. The ESMPs in the ESIA will be value chain specific and consist of a well-documented set of mitigation, monitoring and institutional actions to be taken before and during implementation to eliminate the adverse environmental and social impacts, offset them or reduce them to acceptable levels. The ESIA will also include the measures needed to implement these actions, addressing the adequacy of the monitoring and institutional arrangements for each of the project sites within the State. The consultant will visit the intervention farms, processing plants and the commodity markets; take into account the proposed civil engineering designs, if any, vegetative land management measures and other

activities aimed at managing agricultural and agro-processing activities of the site. The consultant will also assess the natural resources and infrastructures that will be potentially affected during the project implementation and operation. It will also select the management strategies required to ensure that environmental risks are appropriately mitigated.

The objectives of the ESIA are to:

- thoroughly document the baseline conditions of the study area and the socio-economic conditions of the affected communities;
- place the ecological baseline conditions of the concession area in the context of the surrounding region;
- inform, obtain and address contributions from stakeholders including the relevant authorities and the public;
- assess in details, the environmental and social impacts that would result from the project;
- identify the mitigation measures that could reduce the significance of predicted negative impacts or enhance predicted benefits of the proposed projects;
- develop an appropriate Monitoring Plan for the proposed (Name of Ancillary Infrastructure) in the APPEALS projects Area;
- meet the requirements of the national environmental regulatory agencies in Nigeria as well as the international best practice for project of this nature.

1.5 Scope of Work for the ESIA Study

The scope of work (tasks) of the consultant includes the following:

i. Assembling of the relevant baseline information on the project area including its geology, soils, hydrology, climate, surface water quality, noise, air quality and terrestrial and aquatic flora and fauna, impacts to flora and fauna; water use, effluent and waste management;

ii. Provision of the detailed baseline hydrological information for the areas taking into consideration the anticipated works and their implications on the hydrology of the area. The hydrological assessment should focus on reviewing the hydrological information and data for the sites against anticipated project works and establish hydrological dynamics of the project sites based on scenarios such as with and without the project;

iii. Collecting information on the socio-economic background of the project and

identify, as far as possible, and assess the physical, biological, socio-economic as well as, cumulative impacts of the project which will include the transport and processing

components of the project, Social and economic impacts to the local communities including direct benefits such as jobs;

iv. Identifying the relevant laws, guidelines, regulations and standards that would define the operating framework of the project;

v. Describing and analysing the physical, biological and human environment conditions in the study area before project implementation. This analysis shall include the interrelations between environmental and social components and the importance that the society and local populations attach to these components, in order to identify the environmental and social components of high value or presenting a particular interest;

vi. Presenting and analysing alternatives to the proposed project, including the "without project" option, by identifying and comparing the alternatives on the basis of technical, economic, environmental and social criteria;

vii. For the selected alternative, identifying and assessing the potential importance of beneficial and adverse environmental and social, direct and indirect, short and long-term, temporary and permanent impacts, on the basis of a rigorous method;

viii. Presenting the potential environmental and social risks and impacts of the proposed project;

ix. Defining the appropriate mitigation/enhancement measures to prevent, minimise, mitigate, or compensate for adverse impacts or to enhance the project environmental and social benefits, including responsibilities and associated costs;

x. Develop an environmental and social monitoring program, including indicators, institutional responsibilities and associated costs;

xi. As appropriate, prepare an environmental hazard plan including an analysis of the risk of accident, the identification of appropriate security measures and the development of a preliminary contingency plan;

xii. Assess the capacity available to implement the proposed mitigation measures and identify institutional responsibilities and needs for capacity-building if necessary, to implement the recommendations of the environmental and social assessment and associated costs;

xiii. Carry out consultations with primary and secondary stakeholders in order to obtain their views on and preoccupations about the project. These consultations shall occur during the preparation of the ESIA Report to identify key environmental and social issues and impacts, and after completion of the draft ESIA Report to obtain comments from stakeholders on the proposed mitigation/enhancement measures;

xiv. Labour Influx, Sexual Exploitation and Abuse, and Occupational Health and Safety Response Plan, during the construction operations are to be outlined in the ESIA in line with internationally acceptable practices and standards such as the general recommendations for managing physical hazards as addressed in the General EHS

Guidelines. This should comprehensively cover among others protections against, exposure to dust and hazardous materials that may be present in infrastructure materials and other forms of waste and a host of physical hazards associated with the use of equipment in line with this nature of project;

xv. Provide support on all aspects of GBV/SEA risk identification, mitigation and management under APPEALS including any GBV/SEA reporting requirements. The consultant will support the PIUs to reassess the GBV/SEA risk along the project implementation and ensure that the mitigation strategy is updated for newly identified risks;

xvi. Develop an Environmental and Social Management Plan (ESMP) for the project. The ESMP should identify (a) the potential environmental and social impacts that could form project activities along the three priority value chains; (b) the proposed mitigation measures; (c) the institutional responsibilities for implementation; (d) the monitoring indicators; and (e) the institutional responsibilities for monitoring and implementation of mitigation measures.

1.6 Approach/Methodology for the ESIA Study

The approach and methodology for the ESIA involved the following:

- desktop study; review of design reports and literature;
- reconnaissance visits and site inspections;
- public/stakeholder consultations and involvement;
- data collation, analysis and reporting;
- identification and assessment of environmental and social impacts;
- mitigation measures;
- monitoring and management plan.

1.6.1 Review of Available Literature

Information from relevant documents from the project proponents, and other documents on agricultural development will be of immense help to the ESIA study. Key documents reviewed for this study include:

- APPEALS Environmental and Social Management Framework (ESMF)
- APPEALS Resettlement Policy Framework (RPF)
- APPEALS Pest Management Plan (PMP)
- APPEALS Project Appraisal Document (PAD)
- APPEALS Project Implementation Manual (PIM)
- World Bank safeguards policies / Environmental and Social Standards (ESS)
- Intervention Locations

1.6.2 Field surveys and site inspection

Field surveys for the proposed project were carried out from 7th July 2020 to 18th July 2020. The visits included inspections of the proposed intervention areas (the value chains) in order to confirm the environmental and social issues and conditions to be affected or are likely to develop from the implementation of the project. This enabled the consultant to appraise the project area of influence, the nature of the biophysical environment to be affected (especially current land and water uses), the relevant baseline data were also obtained. The socio-economic characteristics of the environment to be potentially impacted by the project including the neighbouring rural communities, current infrastructural status in the project area were captured.

1.6.3 Public/Stakeholder Identification and Consultations

The project proponents have been engaged to understand the project scope, design and implementation and to obtain relevant project documents. Key stakeholders have also been consulted to obtain their comments and concerns on the proposed project with respect to the potential environmental and socio-economic issues. Details of consultations are provided in Chapter 4.

1.7 Structure of the ESIA Report

This ESIA Report was presented in a concise format containing all studies, processes, analyses, tests and recommendations for the APPEALS intervention. The report focused on the findings, conclusions and recommended actions, supported by a summary of the data collected and citations for references used. Below is the indicative Table of Contents and description of the content embedded for the ESIA final report:

Cover Page

Table of Contents

List of Acronyms and their Definitions

Executive Summary

The executive summary provides an overview of the project objectives and a brief project component description in addition to a brief non-technical description of the significant findings and recommendations for environmental management that will be adopted by the investor. This is to eliminate or minimize the adverse impacts to acceptable levels as defined by the appropriate authorities and standards. This section will serve as the main consultation document.

Chapter 1: Introduction: This chapter provides the basic information about the APPEALS project and the Kano State Intervention. The sub-headings will include but not limited to;

- Background

- Rationale for Proposed Project
- Purpose of the ESIA
- Objective and Scope of the Consultancy
- Scope of Work for the ESIA
- Approach / Methodology for the ESIA

Chapter 2: Institutional and Legal Framework for Environmental Management: This section describes the applicable environmental legal, regulatory and policy requirements and associated regulations and standards of the Kano State Government, Nigerian Government and the World Bank. The sub-headings include the following:

- A discussion of the World Bank safeguard policies / Environmental and Social Standards relevant to APPEALS and the proposed project activities in Kano
- A summary of relevant local and federal policies, legal, regulatory, and administrative frameworks

Chapter 3: Project Description and Alternatives

- Location of the proposed Intervention Projects
- Current status of Agriculture activities in Kano State
- Project Alternatives
- Discussion of alternatives to the current project and reasons for their rejection, including short description of likely future scenario without intervention;

Chapter 4: Baseline Environment and Social Conditions:

Baseline information on the biophysical and human settings of Kano State are discussed in this chapter. Emphasis is given to the agriculture cluster areas that will benefit from Kano APPEALS intervention

- Description of the area of influence and environmental baseline conditions including but not limited to the climatic elements, soil and geology, vegetation, drainage, water and air quality will be discussed.
- There will be one season (dry season) data collection of bio-physical environment of sample clusters (Table 3.3) while secondary data from recent EIA or ESIA around the project areas will be used for the second season (wet season).

Socio-Economic Characteristics: This chapter discusses themes and topics particularly on population, land use, planned development activities, settlement and community structures, employment, distribution of income, goods, and services, recreation, health, and cultural properties.

The consultant provides general the information about the types of health implications which are typically connected to the project (if any), with a specific health issue. This will be

integrated into the socio-economic assessment. The social assessment describes the direct and indirect social and economic impacts of the proposed project activities on the affected persons, communities and settlement. This socio-economic information will develop a robust sampling base of the affected people and entities in order to provide a contemporary baseline needed for the evaluation of the impacts as well as the measures to be carried out to mitigate the negative impacts and to enhance positive impacts and opportunities. The analyses include:

- Analysis of the existing livelihood opportunities, income, gender characteristics, age profile, health, transport access, existing community structures at the watershed, community, household, and individual levels;
- Analysis of the existing formal and informal grievance redress mechanisms in and around the intervention area; and
- Presentation of consultations with relevant stakeholders and affected persons.
- Analysis of the status of GBV/SEA in the project community and related issues
- Other relevant topics.

Chapter 5: Potential Environmental and Social Impacts Identification and Evaluation: This chapter provides a discussion on the cumulative effects (as they affect both the tangible and intangible human values) and investigates the potential trans-boundary impacts of the existing agricultural clusters and the proposed APPEALS intervention. This section includes impacts identification, impact prediction and impact evaluation from the proposed investment. This analysis is supported by figures and tables.

Chapter 6: Mitigation Measures: Types of mitigation measures, summary of significant potential adverse impacts and mitigation measures for significant potential adverse impacts.

Chapter 7: Environmental and Social Management Plan (ESMP): The various themes discussed include;

- Discussion of the proposed environmental and social management plans;
- Institutional responsibilities and accountabilities;
- Capacity building plan;
- Public consultation plan;
- Description of grievance redress mechanism (in alignment with the ESMF, RPF, PIM and Kano APPEALS GRM) to address situations of conflicts or disagreements about some of the project activities;
- Monitoring and evaluation plan, including suitable indicators for the proposed project
- Specific ways that GBV risks are to be addressed in the project by identifying mitigation measures including development of a GBV Action plan with accountability and response from work
- Costs of implementing the ESMP.

Chapter 8: Conclusion: This is the final chapter and it provides the conclusion and recommendation from the study. This chapter is followed by the annexes which include:

Annex I: Sample of socioeconomic questionnaire and checklist

Annex II: Consultations with stakeholders

Annex III: Lists of community members consulted (FGD)

Annex IV: Summary of World Bank Safeguard Policies

Annex V: Monitoring costs for significant potential adverse impacts

Annex VI: Pictures of interview sessions

CHAPTER TWO

2.0 INSTITUTIONAL AND LEGAL FRAMEWORK

2.1 Federal Policy, Legal, Regulatory and Administrative Frameworks

As natural resources are being exploited at rates unprecedented in human history, the quality of the environment deteriorates and many of the development projects become unsustainable. This has therefore necessitated the enforcement of relevant environmental protection laws to protect and restore the Nigerian environment.

In the last few decades, environmental awareness regarding the adverse effects of development projects, including agricultural projects, has resulted in the definition of a national framework for environmental protection and national resources conservation. Decree No. 58 of 1958, as amended by Decree No. 59 of 1992, established the Federal Environmental Protection Agency (FEPA) as the apex Government structure for environmental matters in the country. The FEPA put in place the 1989 National Policy on the Environment, revised in 1995, with sustainable development as its goal. FEPA metamorphosed into the Federal Ministry of Environment in 1999. The Environmental Impact Assessment Decree No. 86 of 1992 gives specific powers to the Federal Ministry of the Environment (FME) to facilitate environmental impact assessments (EIAs) on all new projects in Nigeria and make EIA mandatory for new major public or private sector projects, including, amongst others, large-scale agriculture. Thus, the Federal Environmental Act has provisions for environmental management and protection which requires EIAs to be conducted for projects of this nature.

The Constitution of the Federal Republic of Nigeria (CFRN) of 1999 as amended in 2011, provides the general thrust of the nation's environmental policy through S. 20 that provides: "*The State shall protect and improve the environment and safeguard the water, air, land, forest and wild life of Nigeria*." Consequently, subsidiary laws and regulations have been made and international conventions and other instruments entered pursuant to the constitution's set objectives. Relevant Federal and Kano State policies, legislation, regulations and guidelines applicable to the operations of Kano APPEALS are presented in Table 2.1.

Table 2.1: Relevant Federal / Kano State Policies, Legislation, Regulations and Guidelines

Federal Policies			
S/N	**Policy Instrument**	**Year**	**Provision**
1	National Policy on the Environment	1989 revised 1991	This describes both the conceptual and theoretical framework and strategies for achieving sustainable development in Nigeria
2	Agricultural Promotion Policy-The Green Alternative	(APP-2016-2020)	The policy develops the framework for facilitating business alliances, promotion of greater farmers-agri-business linkages, and support for critical infrastructure in the value chain development.
3	National Gender Policy	*2006*	The goal of the National Gender Policy is to build a just society devoid of discrimination, harness the full potentials of all social groups regardless of sex or circumstance, promote the enjoyment of fundamental human rights and protect the health, social, economic and political well-being of all citizens in order to achieve an equitable rapid economic growth; evolve an evidence based planning and governance system where human, social, financial and technological resources are efficiently and effectively deployed for sustainable development.

Federal Legal/Regulatory Instrument			
1	Environmental Impact Assessment Act No. 86, Guidelines for review of EIA report in Nigeria.	*1992 (FMEnv)*	This provides the guidelines for regulating the activities of development projects for which EIA is mandatory in Nigeria. The Act also stipulates the minimum content of an EIA as well as a schedule of projects that require mandatory EIAs
2	The National Guidelines and Standards for Environmental Pollution Control in Nigeria	1991	These represent the basic instrument for monitoring and controlling industrial and domestic pollution in Nigeria
3	National Guidelines on Environmental Management Systems	*(1999)*	This establishes the requirements for an Environmental Management System (EMS) in all organizations/facilities in Nigeria
4	The National Environmental Standards and Regulations Enforcement Agency Act (NESREA Act)	*2007*	Their activities include. Inspection, compliance monitoring, negotiation, legal action and prosecution.Methods of enforcement include: issuance of permit, prohibition and enforcement notices, variation of license conditions, suspension and revocation of license and injunctions to carryout remedial works.
5	Child Rights Act	*2003*	The Act serves as a legal documentation and protection of Children rights and responsibilities in Nigeria. It also serves as a legislation against Human trafficking since it forbids children from being "separated from parents against their will, except where it is in the best interests of the child.
6	Employee's Compensation Act	*2010*	The Act make provisions for compensations for any death, injury, disease or disability arising out of or in the course of employment; and for related matters.
7	Land Use Act	*1978 Modified 1990*	This is the primary legal means to acquire land in the country. The Act vests all land in the territory of each state in the federation in the governor of the State and requires that such land shall be held in trust and administered for the use and common benefit of all Nigerians in accordance with the provisions of this Act
8	*Criminal Code*		The Nigerian Criminal Code makes it an offence punishable with up to 6 months imprisonment for any person who: • Violates the atmosphere in any place so as to make it noxious to the health of persons in general dwelling or carry on business in the neighbourhood, or passing along a public way: or • Does any act which is, and which he knows or has reason to believe to be likely to spread the infection of any disease dangerous to life, whether human or animal.
9	Endangered Species Act	1985	This provides for conservation and management of wild life in Nigeria and the protection of some of her endangered species from extinction as a result of over exploitation.
10	FEPA/ FMEnv. EIA Procedural guidelines	1995	These indicate the steps to be followed in the EIA process throughout project life cycle.
11	S115 National Environmental Protection (The Management of Solid and Hazardous Wastes Regulations)	1991	Regulates the collection, treatment, and disposal of solid and hazardous waste for municipal and industrial sources and give the comprehensive list of chemicals and chemical waste by toxicity categories
12	S19 National Environmental Protection (The NEP (Pollution Abatement in Industries and Facilities Generating Waste) Regulations)	1991	These are the imposed restrictions on the release of toxic substances and requirements of Stipulated Monitoring of pollution to ensure that permissible limits are not exceeded during and after the project.
13	S18 National Environmental Protection (National Effluents Limitations Regulation)	1991	This makes it mandatory for industrial facilities to install anti-pollution equipment. It also makes provision for further effluent treatment, prescribe maximum limit of effluent parameters allowed for discharge, and spells out penalties for contravention.
14	National Environmental (Surface and groundwater Quality Control) Regulations	2011	These regulations are to restore, enhance and preserve the physical, chemical and biological integrity of the nation's surface waters.
15	National Environmental (Air Quality Control) Regulations	2014	These regulations are to improve the control of the nation's air quality.
16	National Environmental (Noise Standards and Control) Regulations	2009	To ensure tranquillity of the human environment and their psychological well-being by regulating noise levels.
17	National Health Act	2014	This deals with public and general health matters
18	Guidelines for bio-physical Environmental Impact Assessment in Nigeria		This deals with the general bio-physical aspects of EIA..
19	Workmen Component Act	1987 Revised 2010	This provides for occupational health and safety

Federal Institutional Framework		
1	The Federal Ministry of Environment (FMEnv)	FMEnv is the government agency charged with the responsibility to administrate and enforce environmental laws in Nigeria. The FMEnv prohibits public and private sectors from embarking on major developmental projects or activities without due consideration, at early stages, for environmental and social impacts. In addition to the EIA Act, the Ministry has produced sectorial including sectorial guidelines on infrastructure development which will be duly considered in the implementation of this project
2	Federal Ministry of Agriculture and Rural Development	The Federal Ministry of Agriculture and Rural Development (FMARD) has the responsibility of optimizing agriculture and integrating rural development for the transformation of the Nigerian economy, with a view to attaining food security and positioning Nigeria as a net food exporter for socio-economic development.
3	The Federal Project Coordinating Unit.	The Federal Project Coordinating Unit. headed by a National Coordinator hosted by FMARD is responsible for the overall coordination of the project
Kano State Environmental Legislations		
1	Kano State Refuse Management and Sanitation Law 2003	The law established REMASAB with the responsibility of managing waste in the State.
2	Kano State Pollution Control Law	Being reviewed to provide adequate control of all forms of pollution in the State.
3	Kano State Solid Waste Management Law	Being reviewed to provide adequate control of dumping all forms of solid wastes in the State.
Kano State Institutional Framework		
1	Kano State Ministry of Environment	The Ministry has the responsibility for the general protection and development of the environment, conservation of biodiversity, natural resources and sustainable development of the State. The Ministry oversees the Refuse Management and Sanitation Board (REMASAB), Kano Afforestation Programme (KNAP), Nigeria Erosion and Watershed Management Project (NEWMAP) and Sustainable Kano Project. Some of the other functions of the State Ministry of Environment include: • Liaising with the Federal Ministry of Environment, FMEnv to achieve a healthy or better management of the environment via the development of the National Policy on Environment; • Co-operating with FMEnv and other National Directorates/Agencies in the performance of environmental functions including afforestation, environmental education/awareness to the citizenry; • Responsibility for monitoring waste management standards; • Responsibility for general environmental matters in the State; and • Monitoring the implementation of ESIA studies and other environmental studies for all development projects at the State level. • Pollution control and environmental health in the State.
2	Refuse Management and Sanitation Board	This serves as the regulatory body to protect and manage tonnages of refuse and wastes produced in the metropolitan area. the environmental issues in the State.; • Protection of air, water and land within the State;
3	Kano Afforestation Programme	Preservation, conservation and restoration to pre-impact status of all ecological process essential for the preservation of biological diversity
4	Kano State Ministry of Agriculture and Natural Resources	Kano State Ministry of Agriculture is saddled with the responsibility to plan, devise and implement the state policies on Agriculture and Natural Resources The ministry has two (2) parastatals which include: • Kano Agricultural and Rural Development Authority (KNARDA) • Kano State Agricultural Supply Company (KASCO)
5	Kano State Agricultural and Rural Development Authority	Kano State Agricultural and Rural Development Authority (KNARDA) has the mandate to ensure sustainable increase in agricultural production, increasing farmers' income and improving food security in the State through effective extension services delivery. It also liaises between research institutions on farmers' problems.
6	Kano State Agricultural Supply Company	Kano State Agricultural Supply Company (KASCO) has the mandate of the supply of good quality agricultural inputs in the State. It also produces

		large amount of fertilizer for farmers in the State and beyond.
7	Kano State Ministry of Women Affairs and Social Development	Kano State Ministry of Women Affairs and Social Development has responsibility of improving the standard living of women and children, in areas of nutrition, health and economy. The Ministry monitors cases of GBV, through its Sexual Assaults Referral Centre (SARC).
8	Kano State APPEALS Coordinating Office	Kano State Project Coordinating Office (Kano-SPC) headed by the State Coordinator and hosted by Kano State Ministry of Agriculture and Natural Resources is responsible for the coordination of APPEALS projects in Kano State. The coordinator is thus directly responsible for coordinating activities of the Site intervention, including the implementation of this ESIA.

2.2 World Bank Operational Safeguard Policies triggered by APPEALS Project in Kano State

World Bank Safeguard Policies provide a platform for the participation of stakeholders in project design and have been an important instrument for building a sense of ownership among local population. The World Bank Environmental and Social safeguard policies are the cornerstones of the Bank's support for sustainable poverty reduction. The main objective of these policies is to prevent and mitigate undue harms to people and their respective environment in the developmental processes. These policies also provide guidelines for the Bank and the borrower staff in the identification, preparation and implementation of programs and projects. Table 2.2 provides the World Bank Operational Policies triggered by APPEALS and those applicable to Kano project sites.

Table 2.2: World Bank Environmental and Social Safeguard Policies Applicable to Kano-APPEALS Agriculture Intervention Clusters

S/N	Environmental and Social Safeguard Policies	Applicability to Kano Sites		Applicability to project due to	How this Project will Address Policy Requirements
		Yes	No		
1	Environmental Assessment (OP/BP 4.01)	[x]	[ ]	Civil works under the project including construction oflast mile connection to roads and utilities, small dams, aggregation centres, processing plants and construction of drainage channel to drain effluents and safely discharge such will have adverse effect on the environment.	An ESMF has been prepared for APPEALS and site-specific mitigation measures have been developed in the ESIA
2	Natural Habitats (OP/BP 4.04)	[x]	[ ]	Civil works and agricultural activities may disturb biodiversity in the project areas. However, the project is not within a biodiversity reserve area.	An ESMF has been prepared for APPEALS and site-specific mitigation measures have been developed in the ESIA
3	Pest Management (OP 4.09)	[x]	[ ]	There is the likelihood of the use of pesticide during the project implementation and operation.	An ESMF has been prepared for APPEALS and site-specific mitigation measures have been developed in the ESIA
4	Physical Cultural Resources (OP/BP 4.11)	[x]	[ ]	Civil works, including excavations channelization will be most unlikely to avoid all cultural heritage sites as well as presently unknown sites that can be expected to be found in any area rich in cultural and historical values.	An ESMF has been prepared for APPEALS and site-specific mitigation measures have been developed in the ESIA
5	Involuntary Resettlement (OP/BP 4.12)	[x]	[ ]	Kano APPEALS supports only existing clusters The activities under infrastructure development may require the acquisition of land (some with economic trees and farms) surrounding intervention area. This will lead to economic and potentially physical displacement. Also, there will be newly empowered farmers who may require green area to start-up.	A Resettlement Policy Framework (RPF) has been prepared for APPEALS. Due to the potential impacts to economic trees and farmlands that may be located around the intervention sites especially for infrastructural development, standalone RAP(s) may be prepared, and measures implemented before project implementation.
6	Indigenous Peoples (OP/BP 4.36))	[ ]	[x]	The people in the area are by the World Bank guidelines not considered as indigenous peoples/ sub-Saharan African historically underserved communities.	N/A
7	Forests (OP/BP 4.10)	[x]	[ ]	Civil works will extend to forest area	An ESMF has been prepared for APPEALS and site-specific mitigation measures have been developed in the ESIA
8	Safety of Dams (OP/BP 4.37)	[ ]	[x]	The proposed project does not involve the design, construction or rehabilitation of any dam of whatever kind.	N/A
9	Projects in Disputed Areas (OP/BP 7.60)	[ ]	[x]	The proposed project area is not known for any dispute (local, national, international) of whatever magnitude.	N/A
10	Project on International Waterways (OP/BP 7.50)	[ ]	[x]	The project is not within any international waterways	N/A

NB: Where there is a gap of conflict between the National Law and World Bank OP 4.12, the higher OP shall prevail which in this case is the World Bank Policy

2.2.1 International Conventions and Agreements

Several international regulations, protocols, treaties and conventions have been signed by countries of the World. The conventions are aimed at halting environmental degradation and thus protecting human health against possible adverse effects. Nigeria subscribes to a number of these International Regulations and Conventions relating to Environmental Protection.

Table 2.3 shows some of the international conventions, agreements and protocols to which Nigeria is signatory and applicable to the Kano State APPEALS project sites.

Table 2.3: International Conventions, Agreements and Protocols to which Nigeria is Signatory and Applicable to the Kano State APPEALS Sites

International conventions, agreements and protocols	Applicable to APPEALS		Applicable to Kano APPEALS		Applicability to project due to	How project address issues raised
	Yes	No	Yes	No		
Both the Vienna convention for the protection of the Ozone Layer and the Montreal protocol for Control of Substances that deplete the ozone layer.	[x]	[ ]	[x]	[ ]	Agricultural works may extend to the forest area. There will be reduction in tree taxonomy and biomass leading to reduction in carbon sink and release of ODS gasses. Some of the crops may also be emitting or when burnt transmit ODS substances	An ESMF has been prepared for APPEALS and site-specific mitigation measures developed in the ESIA.
Basel convention on the prevention of trans-boundary movement of hazardous wastes and their disposal.	[x]	[ ]	[x]	[ ]	Hazardous chemical might be used as pesticides	An ESMF has been prepared for APPEALS and site-specific mitigation measures developed in the ESIA.
Convention on the prevention of the international trade in endangered species (CITES).	[x]	[ ]	[ ]	[x]	No endangered species(s) of any kind was identified in the project area.	NA
Convention on Biodiversity.	[x]	[ ]	[x]	[ ]	Agricultural activities may extend to forest area. This will disturb biodiversity in the area.	ESMF has been prepared for APPEALS and site-specific mitigation measures developed in the ESIA.
Convention on climate change.	[x]	[ ]	[x]	[ ]	Proposed activities will result in both systemic and cumulative environmental change; thereby contributing to a sustained increase in temperature.	An ESMF prepared for APPEALS and site-specific mitigation measures developed in the ESMP.
Convention on Desertification.	[x]	[ ]	[x]	[ ]	Proposed activities may result in deforestation.	An ESMF prepared for APPEALS and site-specific mitigation measures developed in the ESMP.
Convention on Persistent Organic Pollutants.	[x]	[ ]	[x]	[ ]	Organic pollutant may be used for agricultural activities.	An ESMF prepared for APPEALS and site-specific mitigation measures developed in the ESMP.
World Health Organization (WHO) Health and Safety Component of EIA, 1987.	[x]	[ ]	[x]	[ ]	Proposed activities may be injurious to man and the environment	An ESMF prepared for APPEALS and site-specific mitigation measures developed in the ESMP.

Table 2.4: Gap between National Legislations, Policies and Regulations and the World Bank Policies

Category	Nigerian Law	World Bank OP 4.12	Measures to Filling the Gaps
Minimization of resettlement	No requirement to consider all options of project design in order to minimize the need for resettlement or displacement	Involuntary resettlement should be avoided where feasible, or minimized, exploring all viable alternative project designs	A design of footprints of the project-related activities will be undertaken so as to minimize resettlement.
Information and Consultation	It is lawful to revoke or acquire land by the governor after issuance of notice. No consultation is required.	PAPs are required to be meaningfully consulted and participate in the resettlement process	PAPs shall be meaningfully consulted and engaged in the resettlement process
Timing of Compensation	The law is silent on timing of payment	This requires that compensation implementation must take precedence before construction or displacement	Compensation and resettlement implementation to take place before construction or displacement
Livelihood restoration	Makes no proscription on livelihood restoration measures	It requires that vulnerable PAPs have to be rehabilitated	Livelihood restoration measures will be put in place for vulnerable PAPs
Grievance Process	The land use and allocation committee appointed by the Governor is vexed with all disputes/grievances and compensation matters	This requires that a grievance redress mechanism has to be set early constituting the representative of PAPs and, prefers local redress mechanism. The law court is the last resort where the available mechanism or outcome is unsatisfactory to PAP	A grievance redress committee (GRC) shall be established early and existing local redress process shall be considered to address issues of project induced grievances. PAPs or their representatives shall be members of the GRC.
Community land with customary right	Compensation in cash to the community, chief or leader of the community for the benefit of the community	Land for land compensation or any other in-kind compensation agreed to with the community	Land for land compensation or any other in-kind compensation have been agreed to with the community
Agricultural land	Entitled to alternative agricultural land[1]	Land for land compensation	Land for land compensation
Fallow land	No compensation	Land for land compensation	Land for land compensation
Statutory and customary right Land Owners	Cash compensation equal to the rent paid by the occupant during the year in which the right of occupancy was revoked	Recommends land-for-land compensation or other form of compensation at full replacement cost.	Recommends land-for-land compensation or other form of compensation at full replacement cost.
Land Tenants	They are entitled to compensation based upon the amount of rights they hold upon land.	Land tenants are entitled to some form of compensation whatever the legal recognition of their occupancy.	Land tenants are entitled to some form of compensation whatever the legal recognition of their occupancy.
Squatters	These are not entitled to compensation for land, but are entitled to compensation for crops.	These are to be provided with resettlement assistance in addition to compensation for affected assets; but no compensation for land	Squatters are to be provided resettlement assistance in addition to compensation for affected assets; but no compensation for land
Owners of "Non-permanent" Buildings	Cash compensation based on market value of the building (that means depreciation is allowed)	Owners of "Non-permanent Buildings are entitled to in-kind compensation or cash compensation at full replacement cost including labor and relocation expenses, prior to displacement.	Owners of "Non-permanent Buildings are entitled to in-kind compensation or cash compensation at full replacement cost including labor and relocation expenses, prior to displacement.
Owners of "Permanent" buildings, installations	Resettlement in any other place by way of reasonable alternative accommodation or Cash Compensation based on market value.	Owners of "Permanent" buildings, installation are entitled to in-kind compensation or cash compensation at full replacement cost including labor and relocation expenses, prior to displacement.	Owners of "Permanent" buildings, installation are entitled to in-kind compensation or cash compensation at full replacement cost including labor and relocation expenses, prior to displacement.

[1] Nigerian Land Use Act 1978, (2004 LFN)

2.3 Institutional Framework

APPEALS project involves many Federal and State Ministries, Departments and Agencies (MDAs), local governments, communities and the civil society. This is because an effective implementation of projects requires inter-ministerial coordination, collaboration, and information sharing at all levels of government. Thus, each component, sub-component and activity is to be implemented through the relevant Federal and State MDAs. The various MDAs include those responsible for agriculture, planning, economy and finance, works, environment and water resources. The investment for Kano State APPEALS is being made through the Kano State APPEALS. However, the Kano State government has the primary responsibility for land management and land allocations for agriculture purpose.

The Federal Ministry of Agriculture and Rural Development (FMARD) is the lead implementing agency for APPEALS projects. The Federal Project Coordinating Unit headed by a Federal Coordinator hosted by FMARD is responsible for the overall coordination. The Kano State Project Coordinating Unit (Kano -SPC) headed by the State Coordinator and hosted by the Kano State Ministry of Agriculture and Natural Resources is responsible for the coordination in Kano State, thus, the Kano State-SPC is directly responsible for coordinating the activities of the Kano APPEALS projects, including the implementation of this ESIA. Both the Federal and State Level Coordinating units have environmental officers who take responsibility for the mainstreaming of environmental issues into the APPEALS sub-projects.

The Kano State APPEALS Environmental and Social Safeguards Officer is directly responsible for coordinating the implementation of the ESIA on behalf of the State Project Coordinator. At the community level, the Farmers Cluster/CDA/Cooperative will effectively participate in ensuring full compliance during project implementation

CHAPTER THREE

3.0 PROJECT DESCRIPTION AND ALTERNATIVES

This chapter provides a detailed description of the existing conditions under the proposed project and the activities to be undertaken to implement the project**.**

3.1 Location of the Proposed Intervention Project

The APPEALS Project is earmarked for implementation and intervention in some States of the country of which Kano State is one. Kano State is in the North-Western part of Nigeria between latitude $10^0$33' and $12^0$37' North of the equator and longitudes $7^0$43' and $9^0$35' East of Greenwich. It is bordered to the North West and North East by Katsina and Jigawa States respectively, while to the South and South West with Bauchi and Kaduna States, respectively. The Local Governments are shown in a map presented in Figure 3.1.

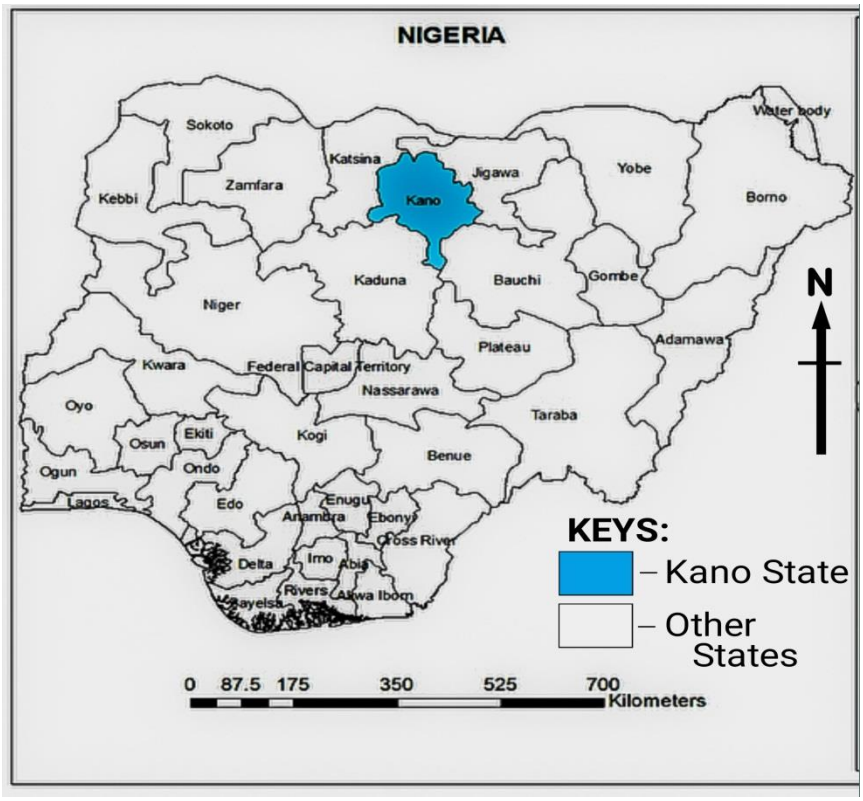

Figure 3.1: Kano State in Nigeria

The State has a total land area of 20,760 square kilometers with a population of 9, 383,682 people amounting to 6.70% of the nation and a projected population of 12,011,906 people by 2016 based on annual growth rate of 2.5% (NPC, 2006). The State has fourty four (44) Local Government Areas (Fig. 3.2).Farming is among the major occupation of the people who are predominantly of Hausa/Fulani ethnic origin. Other ethnic groups inhabiting the State include Yoruba, Igbo, Nupe, Kanuri, Tiv, Ebira as well as other ethnic groups from all over the country, West Africa, Middle East and Asia especially Niger, Yemen, Lebanon, China and India.

Figure 1: Map of Kano
Source: GIS Lab. URP Dept., KUST, Wudil

Figure 3.2 Map of Kano State

3.2 Current Status of Agricultural Activities in Kano State

Kano is currently the most irrigated State in Nigeria with more than 20 dams providing about two million cubic metres of water to support agricultural and industrial activities. Current annual production of grains exceeds four million metric tonnes. Agriculture sector contributes more than 70% of the Gross State Product. Approximately, 50% of the populace is directly or indirectly engaged in some form of agricultural activity including crop, livestock and fishery production, processing and marketing (KNSG, 2018 www.kanostate.gov.ng).The major food/vegetable crops grown in the State include millet, sorghum, soybean, cowpea, maize, wheat, cotton, groundnut, rice, tomato, pepper, onion, garden egg, sweet potato. Other agricultural activities carried out in the state are animal husbandry, fishery, processing, and marketing of agricultural products. The Kano-APEALS interventions are expected to cover all the 44 Local Government Areas of the State. Rice, wheat and tomato are produced, processed and marketed in virtually all the local governments. About 3million and 500,000 tonnes of rice and tomato respectively are produced annually in the State. Majorly, the value chain activities of rice, wheat and tomato are carried out in the following local governments: Bunkure, Garunmallam, Kura, Rano, Garko, Tudunwada, Albasu, Bagwai, Bichi, Dambatta, Dawakin Tofa, Shanono, Ungoggo, Dala, Kano Municipal, Nassarawa, Tarauni and Warawa. Major Rice processing areas in Kano include Kura and Bunkure. Major tomato markets in

Kano include Kwanar Gafan (Garun Mallam), *Liberia*(Dambatta) and 'Yankaba (Nassarawa). Major wheat producing areas are Bunkure (Alkamawa), Ajingi and Rogo, while major processing area is 'Yangurasa (Dala).

Plate 3.1: Rice Production at Bagwai, Kano

Plate 3.2: Wheat Cultivation at Alkamawa, Bunkure

Plate 3.3: Wheat Cultivation at Alkamawa, Bunkure

Plate 3.4: Rice Parboiling at Kura

Plate 3.5: Rice Drying at Kura

Plate 3.6: Burning Wastes of Rice at Kura

Plate 3.7: Wheat Processing into *Gurasa* at Dala

3.3 Proposed Project Activities

The Agro-Processing, Productivity Enhancement and Livelihood Improvement Support (APPEALS) Project is designed to transform the existing large expanse of agricultural land (brown field) into an agricultural production / processing zone. With five project components, the project activities have been divided into three, which include; Agricultural activities, Agro-Processing facilities and infrastructural development as outlined below:

- Agricultural activities: This entails crop and livestock production that would lead to the
    - Development and operation of agricultural fields,
    - Construction of small dams, dykes and weirs such as:
        - Site clearing and/or levelling,
        - Compacting and Blasting,
        - Use of heavy equipment and hazardous materials
        - Material Extraction/quarrying, Slope stability/Excavation, cutting and filling
        - Hazardous materials storage and disposal,
        - Waste management,
        - Construction camps
- Agro-Processing activities: This entails crop and livestock processing and value addition that would lead to
    - Dealing with waste,

- Treatment technologies for wastes in the farms, from processing sites and markets.

- Development of small and medium scale infrastructures such as
  - Transmission and distribution of electricity,
  - Water supply system,
  - Access Roads
    - Site clearing and/or levelling;
    - Compacting and Blasting;
    - Use of heavy equipment and hazardous materials;
    - Material Extraction, quarrying, Slope stability/Excavation, cutting, and filling;
    - Hazardous materials storage and disposal;
    - Waste management;
    - Construction camps..

Table 3.1: Project Components and Activities

S/N	Project Component	Project Activities
1	Production and Productivity Enhancement	• Agricultural activities: Crop and livestock production that involves o Support for the development and operation of agricultural fields, o acquisition and dissemination of improved agricultural inputs, equipment, machinery o development of value chain investment plan o facilitation of access and adoption of proven technologies at scale
2	Women and Youths Empowerment, Post-Harvest Management, Value Addition and Processing	• Crop Processing: Crop and Livestock Produce Processing which involves o Construction/rehabilitation of aggregation centres; o Provision of equipment and machinery for post-harvest handling, storage and quality management, and packaging; o Support to market information and agricultural commodity exchange platforms; o Facilitate value chains coordination around the aggregation centres
3	Infrastructure Support to agribusiness cluster	• Development of small and medium scale infrastructure: Design, rehabilitation and/or construction development of small and medium scale infrastructures such as o transmission and distribution of electricity, o Water supply system, o Access Roads o Provision of last-mile connection to roads networks and utilities (water, energy, transmission lines, gas pipelines, etc).

3.4 Project Alternatives

The following alternative actions were considered for the study area. The "go-ahead" alternative, though more expensive in terms of cost in every respect at the start, is seen to be the most feasible and profitable than the "no action" alternative.

"No Action" alternative: This alternative implies that the Agro Processing; Productivity Enhancement and Livelihood Improvement Support Project investment in the proposed area/location project does not proceed thereby maintaining the status quo. The status of the environmental resources neither improves nor worsens since the state of the resources is not interfered with at all. However, the implementation of this project has many benefits as already stated. The 'No Action Alternative' has various negative and possibly long term impacts to the area which include: (i) the local population continues to suffer from food

scarcity and consequently food insecurity due to lack of agricultural produce; (ii) projected reduction in poverty levels through increased incomes could not be achieved (iii) environmental degradation may worsen due to increased deforestation and erosion in the area.

A "Go Ahead Project Alternative, though more expensive in terms of cost in every respect at the start, is seen to be the most feasible and profitable than the no action alternative. Go ahead alternative is expected to reduce the operational costs for crops production and processing: create thousands of new jobs: reduce the level of poverty and contribute significantly to Nigeria's economy. The development of Agro Processing; Productivity Enhancement and Livelihood Improvement Support Project will strengthen national food security, improve regional economic growth and generally improve livelihoods in the rural farming communities in the project area through increased household incomes arising from opportunities for secured markets, improved productivity, reduced post-harvest losses and increased employment of the locals. In addition, the negative impacts on the environmental resources due to the unsustainable manner in which the local farmers devastate the forest resources to earn a living in the area will be reduced if not eliminated. Instead there will be enhanced knowledge on how these environmental resources could better be used through the knowledge to be gained from the project. This in turn will reduce the overall level of poverty prevalent in the country.

The two scenarios considered herewith are summarized in Table 3.2. The inference from this consideration is that even though the go-ahead option is more expensive, it is a the preferred or most environmentally sound, financially feasible and benign option for achieving project objectives and ensuring economic growth and sustainable development both at the micro and macro scales.

Thus, the advantages of the "go ahead" alternative make it a better option than the "No-Action" alternative.

Table 3.2: Analysis of the Alternatives

S/N	Criteria	No Project Alternative	Go Ahead Project Alternative
1	Consequence on the environment and social well being	Taking a "no action" alternative will negative impact on the environment and the economy of both individuals and the nation. It would also ensures that the government achieves gradually its economic diversification drive from petroleum to non-petroleum focused economy	Intervention would lead to the strengthening of agriculture in a more professionalized and highly organized manner. This will provide room for best practices in soil conservation and sustainable management of natural resources. It will further generate income, which in turn increases the living standard of the individuals and overall improvement of the national economy even in the absence of petroleum product
2	Long-term Effectiveness and Permanence	No action alternative does not meet the long-term effectiveness and permanence criteria of the national and local economy including the agenda to improve the overall management of environmental resources for sustainable development	The go-ahead option will further improve the local and national economy with sustainable development agenda in mind through a careful planning that will be based on informed decision making by all parties including the locals of the project environment
3	Compliance with Applicable or Relevant Appropriate Requirements	Does not require compliance with applicable or relevant appropriate requirements even at local levels	All undertakings will go through an established system of screening to ensure the necessary standard and permit requirements even at the local levels are met.
4	Short-term Effectiveness	No action alternative will not add any input under these criteria	The go ahead alternative will be completed in a long-term period based on the projections. However, the benefits when completed outweighs a "no action" alternative because of the systematic manner of development

CHAPTER FOUR

BASELINE ENVIRONMENTAL AND SOCIAL CONDITIONS

In view of the proposed APPEALS intervention project, there is a need to acquire accurate and dependable baseline environmental and social data about the identified and selected farm clusters in Kano State in order to identify potential impacts of the activities so that feasible options for negative impact mitigation measures can be properly put in place and implemented. The baseline environmental and social conditions of the proposed intervention project area are discussed under the following sub-headings:

- Physical environment
- Biological environment
- Socio-economic and health environment

The description of the baseline conditions for soil, water and air quality of the project area was based on a one-season (dry season) field data gathering conducted in January, 2021, as well as the desktop review of relevant literature (secondary data). Laboratory analyses of the field samples were conducted at Pollution Control Laboratory of the Kano State Ministry of Environment, Near Technology Centre, Farm centre, Kano.

4.1 Physical Environment

Description and documentation of the prevailing environmental conditions of an area where a developmental project would be located is one of the cardinals aim of any well-planned intervention programmes such as the proposed APPEALS project in Kano State. The baseline physical environment data description and documentation typically serve two main purposes; first, it provides a benchmark against which future measurements can be compared for the purpose of determining changes in environmental characteristics over time. Secondly, the process of environmental impacts (positive and negative) prediction, identification and quantification is facilitated by the superimposition of the technical details of the proposed project on the baseline (existing) environmental conditions. In addition, this understanding will foster and aid the process of developing and proffering measures that will reduce negative potential impacts as well as accurate mitigation measures to ameliorate unavoidable negative impacts that may arise from the proposed intervention projects. Aspects of the physical environment examined are outlined below:

i. Climate and Meteorology;
ii. Geology and Hydrogeology;
iii. Soil Quality;
iv. Drainage and surface water resources (hydrology);
v. Groundwater Quality; and
vi. Air Quality and Noise.

4.1.1 Climate and Meteorology

The climate of Kano is mainly the tropical wet-and-dry seasons. The rainfall pattern is unimodal with the highest peak during the month of August. The temperature is averagely warm all year round.(Olofin and Tanko, 2002). Furthermore, the soil of the area is developed on windblown sands derived from acid crystalline rocks of a basement complex It is light, freely draining sandy loam, which is lightly amenable to intensive cultivation. The natural vegetation of the State is savanna. It is Sudan savannah composed of a variety of trees scattered on an expanse of grassland. The trees are characterized by broad canopies and are hardly more than 20m tall. Most of the tree species are adapted to resist drought conditions. The grasses hardly grow taller than 1.5m at maturity and their blades wither and dry during the dry season (Olofin, 1985).

4.1.1.1 Rainfall Characteristics

Rainfall is the most important variable for Agricultural activities especially crop production, however, in Kano State; rainfall has been fluctuating over the years. Therefore, great temporal variation occurs in the amount and no two consecutive years record the same amount (Mustapha *et al*, 2014). The highest annual rainfall amount (1017.6 mm) recorded for a single year in 20 years (2000 – 2019) in Kano was in 2010 while the lowest annual rainfall amount (545.2 mm) was recorded in 2002 (**Figure 4.1**). Therefore, between 2000 and 2019, 2010 and 2002 are the wettest and driest years in the study area respectively. From the computation, it was observed that Kano State receives an average of 806.34 mm of rainfall annually.

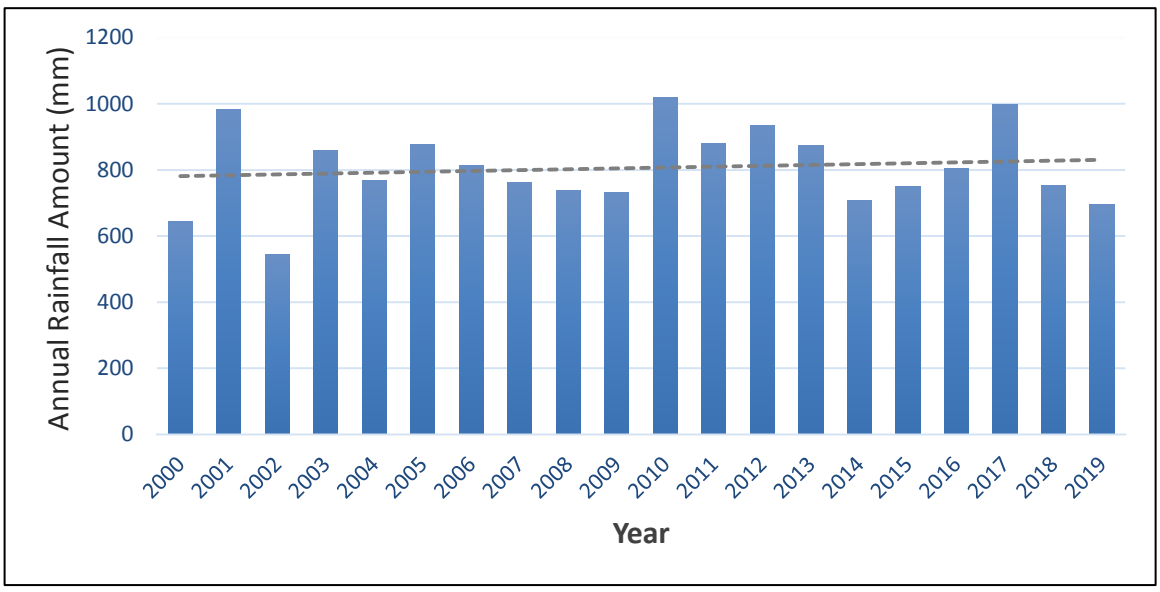

Figure 4.1: Annual Rainfall Amount in Kano (2000-2019)
Source: IITA Historical Data (2000 – 2019)

Average Monthly Rainfall of Kano (2000-2019)

Average monthly rainfall of Kano from 2000 -2019 is presented in Table 4.1.

Table 4.1: Kano Average Monthly Rainfall (2000 – 2019)

Months	Monthly Average (mm)
January	0
February	0
March	0.13
April	7.13
May	48.43
June	143.92
July	211.54
August	266.32
September	116.63
October	12.24
November	0
December	0

Source: IITA Historical Data (2000 – 2019)

Table 4.1 Shows the average monthly rainfall recorded for 20 years in Kano State. It can be noticed that Kano is divided into dry and wet seasons based on the computed average monthly rainfall recorded, because, not every month it rains in Kano State. The dry season covers January, February, November and December while the wet season comprises March, April, May, June, July, August, September and October (**Figure 4.2**). The result revealed that the peak of rainfall in Kano is in the month of August with a monthly average of 266.32 mm. while the month with lowest average monthly rainfall is March with 0.13 mm. It was also observed that only 2 years of the 20 years historical data that received rains in March and also 9 months received rain in April. That means rain mostly starts in May and ends in October in the State.

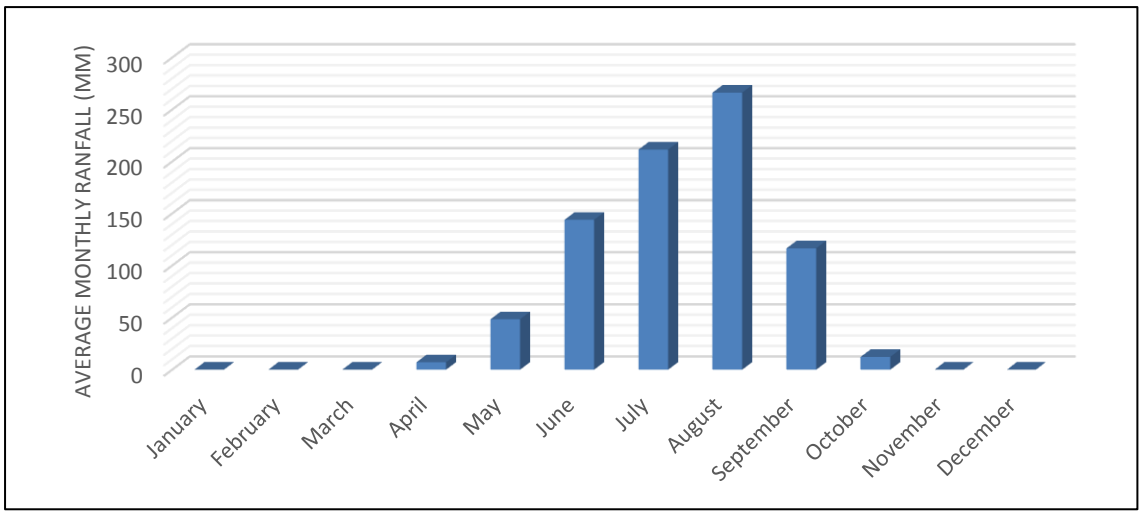

Figure 4.2: Kano Average Monthly Rainfall (2000 – 2019)
Source: IITA Historical Data (2000 – 2019)

Rainy days refer to the number of days rainfall is recorded in a year. Total number of annual rain days varies slightly over the years. The highest number of days received rain in a year was recorded in 2010 with 61 days and the year with the lowest rain days was 2002 which recorded 38 days (**Figure 4.3**). The average annual rainy days was found to be 53.5 days over the period under consideration.

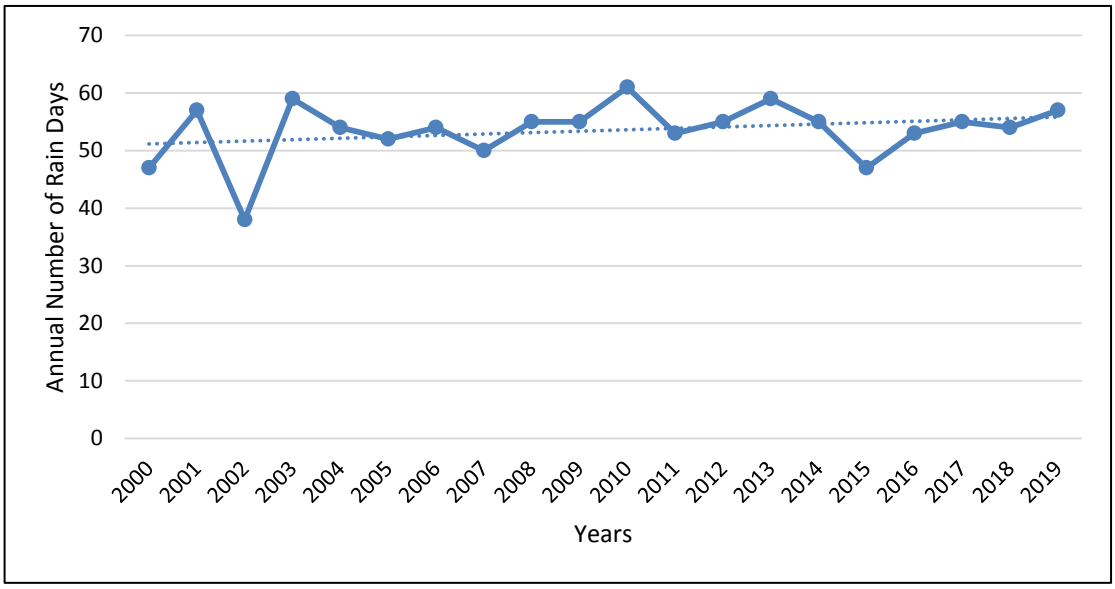

Figure 4.3: Annual Number of Rainy days in Kano (2000-2019)

Source: IITA Historical Data (2000 – 2019)

4.1.1.2 Ambient Temperature Characteristics of Kano State

Kano State is typically very hot throughout the year, though December through February, the State is noticeably cooler (Mustapha *et al*, 2014). Kano is characterized by three temperature seasons. A cool and dry season which lasts from November to February with an average monthly temperature over these 20 years ranging from 22.05 ^{0}C to 25.75 ^{0}C. The harmattan wind prevails at this period. Followed by a hot and dry season which lasts from March to Mid-May with an average monthly temperature during this period ranging from 29.10 ^{0}C in March to as high as 32.60^{0}C in April. Lastly the wet and warm season, it is the period where inter tropical discontinuity runs through Kano region, which brings rainfall to the region. This period lasts from May to mid-September.

Mean monthly Temperature characteristics

The mean monthly temperature during this period is between 26.55 ^{0}C in August to 32.16 ^{0}C in May (**Table 4.2 and Figure 4.4)**

Table 4.2: Average Monthly Temperature Characteristics of Kano State

Month	Avg. Min. Temp. (^{0}C)	Avg. Max. Temp (^{0}C)	Avg. Monthly Temp. (^{0}C)
January	14.2	29.9	22.05
February	17.3	34.2	25.75
March	20.8	37.4	29.10
April	24.8	40.4	32.60
May	25.5	38.8	32.16
June	23.7	35.1	29.40
July	22.7	32.3	27.50
August	22.1	31.0	26.55
September	22.4	32.9	27.65
October	21.4	35.2	28.30
November	17.3	34.2	25.75
December	14.9	31.2	23.05

Source: IITA Historical Data (2000 – 2019)

The highest average monthly temperature recorded n Kano over 20 years (2000 – 2019) was 32.6 ^{0}C and the lowest monthly average was 22.05^{0}C. Therefore, April is the hottest month in Kano (**Figure 4.3)** with minimum and maximum temperatures of 24.8 ^{0}C and 40.4 ^{0}C respectively, while the coolest month is January with an average monthly temperature of 22.05 ^{0}C and a minimum of 14.2 ^{0}C.

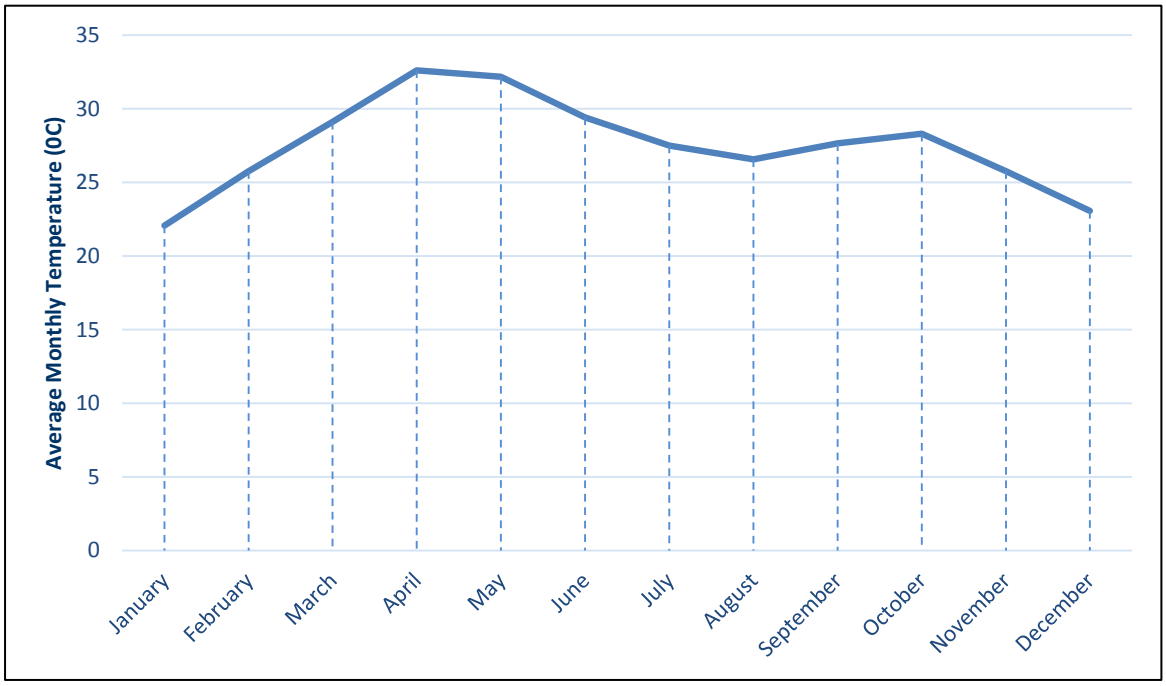

Figure 4.4: Average Monthly Temperature of Kano State

Source: IITA Historical Data (2000 – 2019)

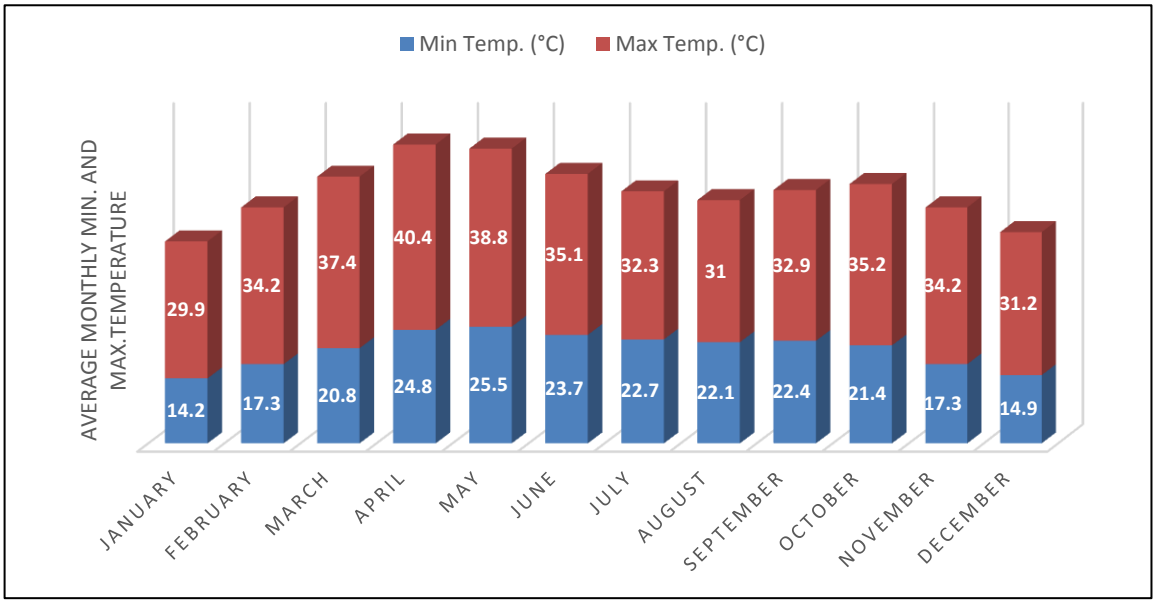

Figure 4.5: Average Monthly Minimum and Maximum temperatures of Kano State

Source: IITA Historical Data (2000 – 2019)

4.1.1.3 Relative Humidity (RH) of Kano

Humidity is a general term used to describe the amount of water vapour in the air. It is the ratio of the amount of water vapour actually in a volume occupied by air to the amount the space could contain at saturation. It reaches its diurnal maximum in the early morning hours when temperatures are low and then decreases to minimum in the early afternoon (Howard *et al* 2010). The Average Monthly Relative Humidity of the State is presented in Table 4.3.

Table 4.3: Average Monthly Relative Humidity

Months	Monthly Average (%)
January	26.04
February	22.81
March	22.89
April	33.78
May	45.72
June	58.00
July	67.44
August	72.33
September	66.94
October	48.44
November	27.17
December	27.94

Source: IITA Historical Data (2000 – 2019)

4.1.1.4 Average Monthly Relative Humidity

Table 4.3 and Figure 4.5 show the average monthly relative humidity in Kano for 20 years. It varies depending on the period of the year and time of the day which is usually high in the

morning. The highest average relative humidity recorded was 72.33 % in August followed by July and September with 67.44 % and 66.94 % respectively. This might be due to the high amount of rainfall received during these period of the year, while the lowest monthly average relative humidity recorded was in the month of February with 22.81%.

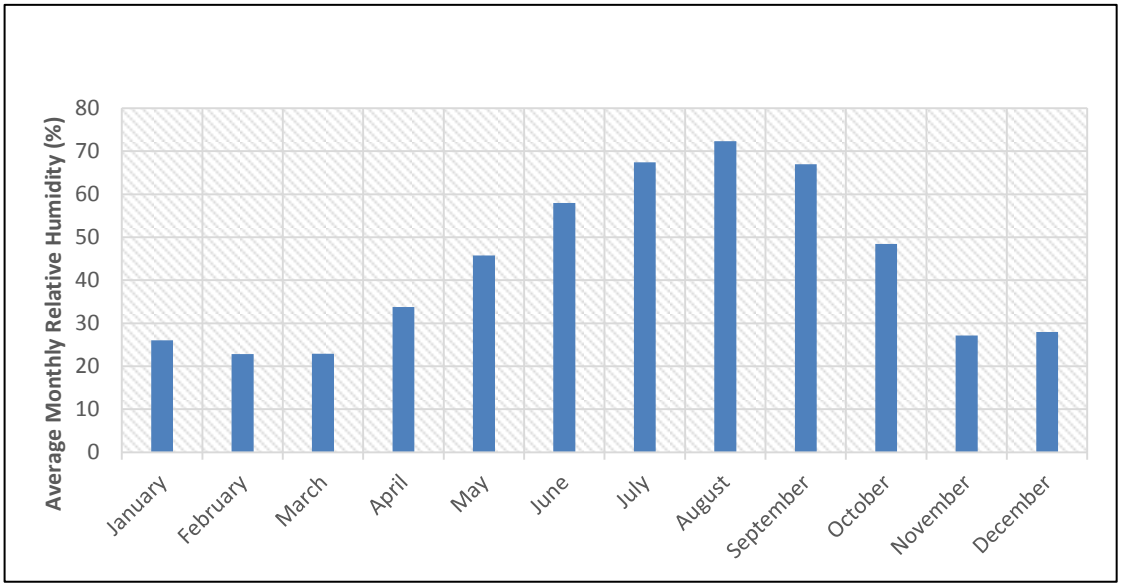

Figure 4.6: Average Monthly Relative Humidity
Source: IITA Historical Data (2000 – 2019)

4.1.1.5 Wind Speed Characteristics of Kano

Wind speed is an atmospheric condition resulting from the force of air moving from high to low pressure, usually due to changes in temperature. The average monthly wind speed in Kano State is presented in Table 4.4.

Table 4.4: Average Monthly Wind Speed

Month	Monthly Average (Km/h)
January	14.34
February	15.11
March	11.94
April	11.94
May	12.33
June	10.53
July	9.39
August	9.33
September	3.93
October	5.76
November	5.34
December	7.99

Source: IITA Historical Data (2000 – 2019)

Average Monthly Wind Speed

Table 4.4 shows wind speed characteristics of the study area. Highest wind speed occurred in the month of February with a monthly average of 15.11 Km/h and the month with lowest wind speed was September, with 3.3 Km/h (**Figure 4.6**)

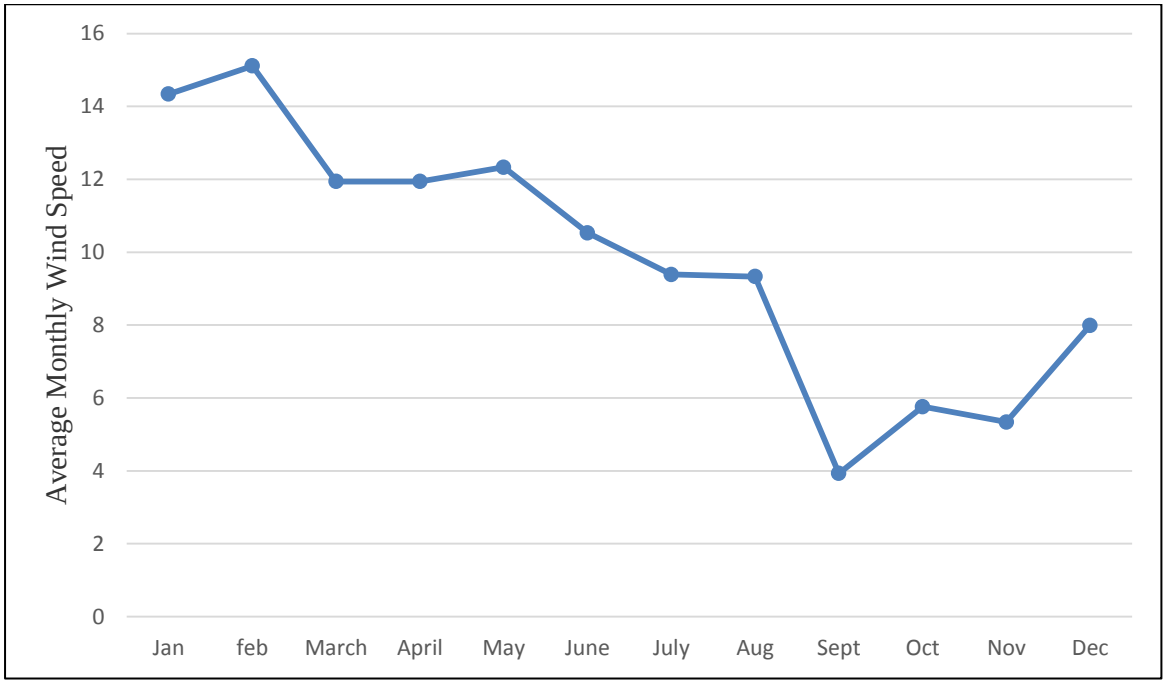

Figure 4.7: Average Monthly Wind speed in Kano State
Source: IITA Historical Data (2000 – 2019)

4.1.2 Geology and Hydrogeology of Kano State

Geology

Kano State is underlain by rocks of the Nigerian basement complex comprising migmatites-gneiss complex, younger metasediments, older and younger granites (Bala *et al*., 2011). MacDonald *et al*., (1986) established that, it is dominantly underlain by undifferentiated metamorphic suite, and older granite, (comprising of coarse pink granite and porphyritic biotite granite), with theolder granite predominating over other rock types. The older granite is composed of coarse-grained granite, granodiorite, diorite and aplite. The lithological varieties are less common than in metamorphic suite. They were emplaced during the Pan African orogeny which was dated about 650±850 ma. The most abundant and typical member of the older granite suite is a coarse porphyritic granite (Oyawoye, 1972). It is typified by the abundant large feldspar set in a ground mass rich in biotite or hornblende. The feldspar may be white, purple, pink, yellowish brown and dark grey.

The schists are considered to be Upper Proterozoic supracrustal rocks which have been infolded into the migmatites-gneiss-quartzite complex (Obaje, 2009). According to Magdi (2009) schists occupy an area within the ‘’walled city’’ to the north central part of Kano. In

hand specimen, the schists are fine to medium grained schistose rocks of pellitic to psamitic character. They are reddish to greenish grey in colourand highly weathered. They are found to be associated with diorite.This association indicates that schists have been intruded by small dioritic bodies, and are considered older than diorites in the area.

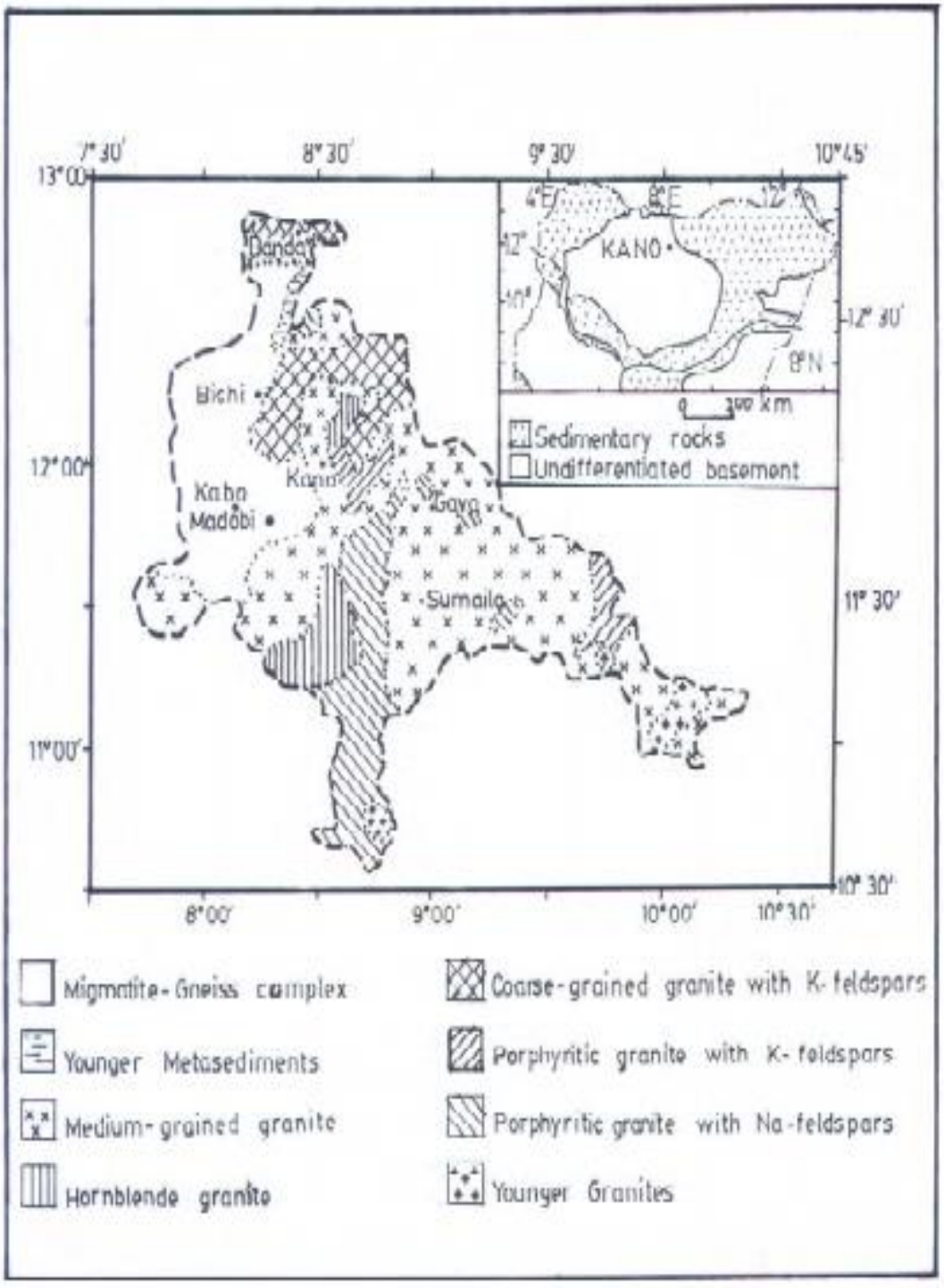

Figure 4.8: Geological Map of Kano State. (Inset) Location of Kano in the Geological Map of Nigeria (After Bala *et. al*., 2011).

Hydrogeology

In the study area, groundwater occurs within the weathered mantle or in the joint and fracture systems of the unweathered or partly weathered rocks (MacDonald *et al*., 1986). Dupreez and Barber, (1965) proposed that well should be located in the weathered mantle and fractured rock where permeability and porosity are sufficient to allow appreciable amount of water to accumulate in storage. The high groundwater yield in the area is found where thick overburden overlies fractured zones. The older granite has been subjected to many tectonic movements and pressure through geologic history such that they often have several fracture lines.

Isa (1984) investigated the hydraulic properties of the basement complex and Chad formation aquifers of Kano State based on pumping testing of selected boreholes. He obtained the average value of transmissivity (T) in basement complex of the study area to be $0.51m^2$/hr ($12.32m^2$/day). Coefficient of permeability (hydraulic conductivity) (k) is 0.0138m/hr (0.33m/day). Specific capacity is $0.36m^3$/1m of drawdown.

4.2 Water Quality

Surface water samples were collected at Bugau, Alkamawa and Yadakwari while groundwater samples (totalling 9 in number) were collected from different existing boreholes and hand dug wells within the study area.

Water samples were collected into a 2-litre polyethylene bottle for general physico-chemical analysis, while samples for oil and grease determination were collected in 1-litre glass bottle and preserved with concentrated sulphuric acid. Samples for heavy metals were fixed with concentrated nitric acid. Pre-sterilized 50 ml McCartney bottles were used for samples meant for microbial analysis. In-situ measurements of pH, Electrical Conductivity, Total Dissolved Solids (TDS), Temperature, and Dissolved Oxygen (DO) were taken at each location using Extech Digital DO700 meter. The water samples were stored in insulating materials containing ice chests and ice chips (to maintain 4^oC) and transferred to the Pollution Control Laboratory for further analysis.

The sample collection was carried out with appropriate quality assurance and quality control (QA/QC) measures in consistent with relevant local and international guidelines and standards. These measures include, amongst others: in situ measurement of parameters with short holding time in groundwater and surface water samples immediately after collection.

- Proper calibration of all portable meters used for in situ measurements and collection of separate samples for parameters requiring different treatment/preservation before analysis.

- Adequate preservation and labelling of collected samples and use of disposable rubber hand gloves in order to avoid cross contamination and use of only recommended sample containers to store sample media.

- Adequate labelling of chemical reagents used for sample preservation in order to avoid mix-up.

- Proper documentation of in-situ readings in datasheets and field notebooks.

4.2.1 Water Quality Results at Bugau Rice Farms

Groundwater and Surface Water (Dry Season)

Results of the measured groundwater and surface water quality parameters at the selected sampled farms are presented in Table 4.5. The surface water sampled is slightly neutral with a pH range of 6.82 to 7.11 and a mean value of 6.98. The water samples from the Bugau Farm recorded the lowest pH value of 6.98, reflecting a clear environment. Dissolved Oxygen (DO) in the surface water ranged from 4.8 – 5.3 mg/L with a mean of 5.03 mg/L. The mean DO is within the World Health Organisation (WHO) limit of 7.5 mg/L. The mean (221.13 µS/cm) EC was within the tolerance level recommended by the WHO. Similarly, the mean TDS value (49.6 mg/L) recorded in the water samples was within the WHO limit of 500mg/L. The surface water temperature mean was 27.43^0C and it does not breach the NSDWQ limit of 35^0C. No heavy metal pollution was recorded in the surface water samples when compared with the FMEnv and WHO maximum permissible limits.

Plate 4.1: Collection of Water Sample at Bugau Rice Farm

Groundwater (dry season)

The physico-chemical properties of the groundwater samples collected from the study area are presented in Table 4.5. The dry season physico-chemical properties of groundwater samples at Bugau indicated that there was no signs of heavy metals and hydrocarbon pollution reported in the groundwater samples.

Table 4.5: Groundwater and surface water quality assessment at Rice Farm, Bugau town, Kura, along Rano Road (dry season)

S/N	Parameters	Unit	FM_{EVN} Limit	Ground water results	Surface water results		
					BSW_1	BSW_2	BSW_3
1.	Colour	-	-	Colourless	Light milk colour	Colourless	Colourless
2.	Odour	-	-	Odourless	Odourless	Odourless	Odourless
3	pH	-	6.5 – 8.5	6.86	7.01	7.11	6.82
4.	Conductivity	µs/cm	1000	50.3	183.4	202.6	277.4
5.	Turbidity	NTU	5	1.14	2.06	2.11	0.83
6.	Temperature	^0C	NS	28.3	26.9	27.3	28.1
7.	Salinity	ppt	NS	0.962	0.006	0.211	0.041
8.	TDS	mg/L	500	23.4	93	102	74
9.	DO	mg/L	7.5	5.06	5.3	4.8	5.0
10.	BOD	mg/L	50	0.18	3.1	2.3	2.9
11.	COD	mg/L	NS	13.46	24.440	16.00	17.41
12.	TSS	mg/L	NS	4.430	1.830	0.821	0.662
13.	Ammonia (NH_3)	mg/L	-	0.0021	0.124	0.061	0.070
14.	Nitrate (NO_3^{2-})	mg/L	-	11.46	2.140	1.821	1.261
15.	Sulphate (SO_4^{2-})	mg/L	250	4.662	18.41	08.3	07.9
16.	Phosphate (PO_4^{2-})	mg/L	50	0.01	0.211	0.12	0.18
17	Sodium	mg/L	200	0.457	18.44	43.06	32.66
18.	Calcium	mg/L	200	0.262	4.321	3.221	3.006
19.	Magnesium	mg/L	NS	0.284	2.000	3.721	2.896
20.	Potassium	mg/L	NS	0.419	1.086	1.499	2.007
21.	Oil & Grease	mg/L	0.05	0.0	0.0	0.0	0.0
22.	THC	mg/L	0.05	0.002	ND	ND	ND
23.	Iron (Fe)	mg/L	0.03	0.05	1.40	2.16	1.32
24.	Zinc (Zn)	mg/L	5.0	0.046	0.148	0.206	0.261
25.	Cupper (Cu)	mg/L	0.01	0.00	0.222	0.183	0.214
26.	Lead (Pb)	mg/L	0.05	0.00	0.00	0.00	0.00
27.	Mercury (Hg)	mg/L	0.002	0.00	0.00	0.00	0.00
28.	Chromium (Cr)	mg/L	0.1	0.0001	0.00	0.00	0.00
29.	Cadmium (Cd)	mg/L	-	0.0	0.00	0.00	0.00
30.	Nickel (Ni)	mg/L	0.01	0.0	0.00	0.00	0.00
31.	Total Coliform	Cfu/ml	NS	ND	ND	$0.16x10^1$	ND
32.	Hydrocarbon Utilizing Bacteria	Cfu/ml	NS	ND	ND	ND	ND
33.	Total Heterotrophic Bacteria	Cfu/ml	NS	ND	ND	ND	ND
34.	Total Heterotrophic Fungi	Cfu/ml	N	ND	ND	ND	ND

4.2.2 Air quality and noise at Bugau rice farms

In situ air quality and noise measurements were carried at a total of 5 locations across the entire sampled farms. For air quality, the parameters measured include Nitrogen Oxide (NO), Nitrogen Dioxide (NO_2), Sulphur Dioxide (SO_2), Hydrogen Chloride(HCL), Total Volatile

Organic Carbon (TVOC), Carbon Dioxide (CO_2) and Carbon Monoxide (CO). An in situ measurement was conducted using a pre-calibrated Crown Corn Gasman air quality equipment. The results in Table 4.6 indicated that the CO and NO were below the equipment detection limit. The SO_2 was detected at four locations (about 30% of the farms sampled) and its values ranged from 0.00- 0.01 ppm. The measured SO_2 values were generally within the FMEnv limit of 0.1ppm, probably due to low vehicular movements at the time of sampling. The NO_2 was detected in all the sampled farms and it ranged from 0.0 – 0.0 ppm with a mean of 0.0 ppm. The mean TVOC was 0.0 ppm and it does not breach FMEnv's limit of 1.60 ppm. Also, observed Hydrogen Chloride (HCL) values range from 0.01 – 0.02 ppm with mean values of 0.015 ppm, HCL suggested alarm level of this corrosive gas is between 2-5 ppm. Hence, all recorded HCL values are below the suggested alarm levels. As earlier observed, CO and NO were taken to be within their respective FMEnv's limits since they were not detected in any of the sampled locations during the study while the mean relative humidity and air temperature were 16.2% and 28.88°C respectively.

In addition, Particulate Matter (PM) was measured in situ using Particle Meter//Particle Counter. Four mass ranges of particulates measured were $PM_{2.5}$, $PM_{1.0}$, PM_{10} and Total Particulate Matter (TPM). Average noise levels at each monitored farm were taken with a digital, battery-powered, Sound Pressure Level (SPL) meter (Sound Meter). The results of the ambient noise measurements are presented in Table 4.6.

Particulates were detected in all the sampling locations however; there was no record where TPM FMEnv limit of 1-hour averaging value of 600 g/m^3 was breached in all the sampled rice farms.

Plate 4.2: In-situ Measurement of Air quality at Bugau Rice Farm

Noise levels at Rice Farms

Lowest noise level recorded across the rice farms was 60.00 dB(A) and the highest was 74.0 dB(A) while its mean was 67.04 dB(A). The highest value of 74.0 dB(A) was recorded at **BRF_D** rice farm which is located closer to roadside, due to vehicular noise. Across all the sampled farms, the FMEnv maximum noise level limit of 90 dB(A) was not exceeded.

Table 4.6: In-situ air quality assessment of rice farms at Bugau

S/N	Parameters	Units	FMEnv LIMIT	BRF_A	BRF_B	BRF_C	BRF_D	BRF_E
1.	Latitude	-	-	11.74324	11.76083	11.75932	11.72283	11.70327
2	Longitude	-	-	8.46703	8.42253	8.42265	8.43666	8.40009
3.	Altitude	m	-	482	491	490	499	478
4.	Angle	0	-	311^0NW	158^0SE	167^0SE	33^0NE	160^0NW
5.	Carbon Monoxide (CO)	ppm	10.0	0.82	0.22	0.00	0.00	0.00
6.	Carbon (IV) Oxide (CO_2)	ppm	NS	418	554	397	418	526
7.	Oxygen (O_2)	%Vol	-	20.9	21.9	21.5	20.9	20.9
8.	Sulphur dioxide (SO_2)	ppm	0.10	0.01	0.00	0.00	0.00	0.00
9.	Nitrogen dioxide (NO_2)	ppm	0.06	0.0	0.0	0.0	0.0	0.0
10.	Hydrogen Sulphide (H_2S)	ppm	-	0	0	0	0	0
11.	Hydrogen Cyanide (CN)	ppm	-	0	0	0	0	0
12.	Nitrogen Oxide (NO)	ppm	NS	0.1	0.0	0.1	0.0	0.0
13.	Hydrogen Chloride (HCl)	ppm	2.5	0.01	0.00	0.02	0.00	0.00
14.	TVOC	mg/m^3	1.60	0.00	0.00	0.00	0.00	0.00
15.	HCHO	mg/m^3	NS	0.00	0.00	0.00	0.00	0.00
16.	Relative Humidity	%	Ambient	15	19	14	15	18
17.	Temperature	^0C	-	29.8	29.0	27.9	28.5	29.2
18.	$Pm_{2.5}$	$\mu g/m^3$	-	9	7	10	12	8
19.	Pm_{10}	$\mu g/m^3$	-	3	2	4	5	3
20.	$Pm_{1.0}$	$\mu g/m^3$	-	1	1	2	3	1
21.	Ex	% Lel	-	0	0	0	0	0
22.	Sound Level	dB	90	62.3	60.0	73.2	74.0	65.7
23.	AQI	-	-	Excellent	Excellent	Excellent	Excellent	Excellent

Plate 4.3: In-situ Measurement of Noise at Bugau Rice Farm

4.2.3 Soil quality at Bugau rice farms

Soil samples were collected at different locations in the study area. At the sampling location, representative soil samples were collected at depths of 0- 15 cm (topsoil) and 15–30 cm (sub soil). The soil was collected with a steel soil augar and transferred into a clean container where it was sub-sampled into different sampling containers. Each soil sample was properly labelled with a unique code to avoid possible miss-up and later transferred to Pollution Control Laboratory, Farm Centre, Kano State Ministry of Environment, for analysis. The results of the soil quality analysis are presented in Table 4.7 below.

The pH value recorded in the soil samples reflected a slightly acidic to slightly medium, probably due to long period of irrigation and frequent use of acidic fertilizers over time. The moisture contents of soil samples in the study area ranged from 10.4 % to 15.3 %. The amount of moisture in soil depends on many factors which include soil type, soil organisms, soil organic matter and climatic conditions.

The concentrations of Mg, Ca, Na, and K recorded in soils from the study area fall within natural occurrence levels for tropical soils as prescribed by Alloway (1991). Similarly, no heavy metal pollution was recorded in the soil samples. Among the heavy metals analysed in the soil samples, Sodium (Na) recorded the highest concentration with a range of 6.06 mg/kg to 19.23 mg/kg in the soil. This could be due to the geological formation of the soils in the study area. Mercury (Hg), Cadmium (Cd), Chromium (Cr) and Lead (Pb) were not detected in any of the soil samples. Other heavy metals, such as Nickel (Ni) were detected in trace amounts, below the prescribed limits for unpolluted soil.

No hydrocarbon pollution was recorded in the soil samples. Oil and grease were not detected in any of the soil samples while THC was also not detected.

Table 4.7: Physicochemical and microbial parameters of top soil (0-15)cm and subsoil (15-30)cm at Bugau Rice Farms, Kano State

S/N	Parameters	Unit	FM_{EVNT} LIMIT	BRF_T (0-15)cm	BRF_s (15-30)cm
1.	pH	-	6.5 – 8.5	5.79	6.08
2.	Conductivity	µs/cm	1000	44.3	56.0
3.	Moisture Content	%	-	10.4	15.3
4.	Colour	-	-	Brownish	Brownish
5.	Texture	-	-	Loamy	Clay
6.	TOC	mg/kg	%	2.88	1.88
7.	Permeability	cm/hr	-	0.66	0.01
8.	Erosion Potential	m/s	-	0	0
9.	Grain Size	mm	-	0.462	0.021
10.	Chloride	mg/kg	-	9.77	12.30
11.	Nitrate	mg/kg	-	1.83	3.56
12.	Sulphate	mg/kg	-	0.49	1.31
13.	Phosphate	mg/kg	-	0.73	0.22
14.	Oil an Grease	cm3	-	ND	ND
15.	THC	mg/kg	50	ND	ND
16.	Cupper	mg/kg	5 – 500	0.22	0.291
17.	Lead	µg/kg	2 – 20	0.00	0.00
18.	Cadmium	µg/kg	0.03 – 0.30	0.00	0.00
19.	Chromium	mg/kg	-	0.00	0.00
20.	Mercury	µg/kg	NS	0.00	0.00
21.	Nickel	mg/kg	5 – 500	0.011	0.01
22.	Sodium	mg/kg	-	19.23	6.06
23.	Magnesium	mg/kg	-	1.78	1.16
24.	Calcium	mg/kg	-	2.29	2.02
25.	Potassium	Cfu/ml	-	4.07	4.41
26.	Hydrocarbon Utilizing Bacteria $x10^2$	Cfu/ml	-	ND	ND
27.	Hydrocarbon Utilizing Fungi $x10^1$	Cfu/ml	-	ND	ND

4.2.4 Water Quality Results at Alkamawa Wheat Farms

Surface Water (Dry Season)

Results of the measured surface water quality parameters at the selected sampled farms are presented in Table 4.8. The surface waters sampled are slightly acidic with a pH range of 6.0 to 6.3 and a mean value of 6.15. The water samples at Alkamawa recorded the lowest pH value of 6.0.. Dissolved Oxygen (DO) in the surface water ranged from 4.8 – 5.5 mg/L with a mean of 5.15 mg/L. The mean DO is within the World Health Organisation (WHO) limit of 7.5 mg/L. The mean (435.00 µS/cm) EC was within the tolerance level recommended by the WHO. Similarly, the mean TDS value (64.8 mg/L) recorded in the water samples was within the WHO limit of 500mg/L. The surface water temperature mean was 24.5^0C and it does not breach the NSDWQ limit of 35^0C. No heavy metal pollution was recorded in the surface

water samples when compared with the FMEnv and WHO maximum permissible limits, as indicated.

The dry season results of physico-chemical and microbial properties of the surface water are presented in the data were sourced from the analysis carried out at Alkamawa wheat farm (2021). No heavy metal pollution was recorded in the surface water samples during the dry season samples.

Plate 4.4: In-situ Collection of Surface Water Sample at Alkamawa Wheat Farm

Table 4.8: Groundwater and surface water quality assessment at Wheat Farms, Alkamawa town, Bunkure, Kano State (dry season)

S/N	Parameters	Unit	FM_{EVT}/WHO/ NSDWQ	AWFS1	AWFS2
1.	Colour	-	-	Colourless	Colourless
2.	Taste	-	-	Tasteless	Tasteless
3.	Odour	-	-	Odourless	Odourless
4.	pH	-	6.8 – 8.5	6.0	6.3
5.	Conductivity	µs/cm	1000	468	402
6.	Salinity	ppt	NS	0.4	0.2
7.	Temperature	^{0}C	NS	24.7	24.3
8.	Turbidity	NTU	NS/	1.87	1.49
9.	TDS	ppm	500	28.6	101
10.	DO	mg/L	7.5	5.5	4.8
11.	BOD	mg/L	50	2.1	1.7
12.	Sodium (Na)	mg/L	200	48.86	59.30
13.	Potassium (K)	mg/L	NS	5.30	3.44
14.	Nitrate (NO_3^{2-})	mg/L	50	14.70	26.20
15.	Sulphate (SO_3^{2-})	mg/L	400	0.983	2.182
16.	Magnesium (mg)	mg/L	30	0.663	1.231
17.	Calcium (Ca)	mg/L	75-200	10.23	18.43
18.	THC	mg/L	0.05	ND	ND
19.	COD	mg/L	90	3.20	2.63
20.	Nickel (Ni)	mg/L	NS	ND	ND
21.	Zinc (Zn)	mg/L	5.0	1.80	1.42
22.	Cobalt (Co)	mg/L	NS	ND	ND
23.	Arsenic (Ar)	µg/L	0.1	ND	ND
24.	Iron (Fe)	mg/L	1/0.03	0.006	0.62
25.	Chromium (Cr)	mg/L	Nil/0.1	ND	ND
26.	Total Coliform Count	Cfu/ml	NS	$1.0x10^3$	$1.7x10^2$
27.	Total Yeast Count	Cfu/ml	NS	ND	ND
28.	Total Fungal Count	Cfu/ml	NS	ND	ND

Undergroundwater Quality Results (Dry Season)

The dry season physico-chemical properties of groundwater samples within the area of influence of the analysis are presented in Table 4.9. The data were sourced from Pollution Control Laboratory at Alkamawa wheat farm Kano State (2021). No signs of heavy metals and hydrocarbon pollution were reported in the groundwater samples.

Table 4.9: Underground water quality parameters at Alkamawa wheat farms

S/N	Parameters	Unit	FM_{EVN} LIMIT	Underground Water
1.	Colour	TCU	-	
2.	pH	-	6.5 – 8.5	6.8
3.	Taste	-	-	Tasteless
4.	Odour	-	-	Odourless
5.	Temperature	^0C	<40	26.7
6.	TDS	ppm	500	13
7.	TSS	mg/L	NS	0.7
8.	Electrical Conductivity	µs/cm	1000	26
9.	Alkalinity	mg/L	-	40.0
10.	Turbidity	NTU	1.0	1.0
11.	Total Hardness	mg/L	-	121
12.	Sulphate (PO_4^{2-})	mg/L	-	0.63
13.	Nitrate (NO_3^2)	mg/L	50	14.4
14.	Phosphate	mg/L	-	0.002
15.	BOD	mg/L	-	0.67
16.	COD	mg/L	-	8.32
17.	THC	mg/L	NS	0.001
18.	Oil & Grease	cm3	0.05	0.000
19.	DO	mg/L	7.5	5.82
20.	Potassium (K)	mg/L	-	0.883
21.	Sodium (Na)	mg/L	-	0.200
22.	Magnesium (mg)	mg/L	-	0.301
23.	Iron (Fe)	mg/L	0.3	0.02
24.	Chlorine Free (Cl)	mg/L	250	0.00
25.	Calcium (Ca)	mg/L	-	0.363
26.	Zinc (Zn)	ppm	5	0.0620
27.	Arsenic (As)	µg/L	0.01	0.0
28.	Cadmium (Cd)	µg/L	0.003	0.0
29.	Manganese (Mn)	mg/L	0.2	0.0
30.	Lead (Pb)	µg/L	0.01	0.0
31.	Cupper (Cu)	mg/L	1	0.0

Plate 4.5: Underground Water Sample

4.2.5 Air quality and noise at Alkamawa Wheat farms

In situ air quality and noise measurement was carried at a total of 5 locations across the entire sampled farms. For air quality, the parameters measured include nitrogen oxide (NO), nitrogen dioxide (NO_2), Sulphur dioxide (SO_2), Hydrogen Chloride (HCL), Total Volatile Organic Carbon (TVOC), Carbon dioxide (CO_2), and Carbon monoxide (CO). In situ measurement was conducted using a pre-calibrated Crown Corn Gasman air quality equipment. The results are presented in Table 4.10.

Plate 4.6: In-situ Measurement of Air at Alkamawa Wheat Farm

In addition, Particulate matter (PM) was measured in situ using Particle Meter/Particle Counter. Particulates measured were $PM_{2.5}$, $PM_{1.0}$, PM_{10} and Total Particulate Matter (TPM). Also, atmospheric parameters (temperature and relative humidity) were determined. The results are presented in Table 4.10.

Average noise levels at each monitored farm were taken with a digital, battery-powered, Sound Pressure Level (SPL) meter (Sound Meter). The results of the ambient noise measurements are presented in Table 4.10

Summary of the gaseous air pollutants concentration at the selected sampled rice farms, including the in-situ weather conditions (relative humidity (RH) and atmospheric temperature) is shown. The SO_2 was not detected in the whole farm land. NO_2 ranges from 0.03ppm – 0.023, the highest value is at AWF_A (0.03ppm) due to proximity to the roadside. Meanwhile, the CO (4.22ppm) at AWF_E. NO was detected in the sampled wheat farm which ranges from (0.10 – 0.32ppm) the highest value is at AWF_B. Furthermore, TVOC ranges from 0.0– 0.0ppm and its mean value was 0.0ppm, there was no location where the TVOC values breached the FMEnv's limit of 1.60 ppm. All detected HCL values were below the suggested critical levels of 2-5 ppm. Mean RH was 17% while mean air temperature was 29.44°C.

Particulates at Wheat Farms

Particulates were detected in all the sampling locations however; there was no record where TPM FMEnv limit of 1-hour averaging value of 600 g/m^3 was breached in all the sampled rice farms across the farms.

Noise levels at Wheat Farms

Lowest noise level recorded across the rice farms was 53.9 dB(A) and the highest was 74.4 dB(A) while its mean was 65.68 dB(A). The highest value of 74.4 dB(A) was recorded at **AWF_c** rice farm which is located closer to roadside, due to vehicular noise. Across all the sampled farms, the FMEnv maximum noise level limit of 90 dB(A) was not exceeded. Across all the value chains, the FMEnv maximum noise level limit of 90 dB(A) FMEnv 8-hour limit exposure was not exceeded during the study. The air quality index in **AWF_b**, **AWF_c** and **AWF_d** were found as excellent, while **AWF_a** and **AWF_e** were found to be good.

Table 4.10: In-situ air quality assessment of wheat farms at Alkamawa

S/N	PARAMETERS	UNITS	FM_{EVT} LIMIT	AWF_A	AWF_B	AWF_C	AWF_D	AWF_E
1.	Latitude	-	-	11.74432	11.74443	11.74434	11.74886	11.748002
2.	Longitude	-	-	8.73144	8.73121	8.73093	8.73400	8.732011
3.	Altitude	m	-	436	440m	433m	522	402
4.	Angle	o	-	248^0SW	25^0NE	135^0SE	5^0SW	127^0NE
5.	Carbon Monoxide (CO)	ppm	10.0	4.01	2.20	1.86	1.02	4.22
6.	Carbon (IV) Oxide (CO_2)	ppm	-	583	561	622	671	592
7.	Oxygen (O_2)	%Vol.	-	20.9	20.9	20.9	20.9	20.9
8.	Sulphur dioxide (SO_2)	ppm	0.10	0.0	0.0	0.0	0.0	0.0
9.	Nitrogen dioxide (NO_2)	ppm	0.06	0.03	0.01	0.00	0.023	0.00
10.	Hydrogen Sulphide (H_2S)	ppm	-	0.00	0.00	0.00	0.00	0.00
11.	Hydrogen Cyanide (CN)	ppm	-	0.00	0.00	0.00	0.00	0.00
12.	Nitrogen Oxide (NO)	ppm	NS	0.0	0.32	0.21	0.00	0.10
13.	Hydrogen Chloride (Cl_2)	ppm	2-5	0.01	0.06	0.02	0.12	0.06
14.	Total Volatile Organic Carbon (TVOC)	mg/m^3	1.60	0.000	0.000	0.000	0.000	0.000
15.	Formaldehyde (HCHO)	mg/m^3	NS	0.000	0.000	0.000	0.000	0.000
16.	Relative Humidity	%	-	19	15	15	20	16
17.	Air Temperature	^0C	Ambient	29.5	28.5	31.8	29.1	28.3
18.	Pm 2.5	$\mu g/m^3$	-	8	10	11	13	9
19.	Pm 1.0	$\mu g/m^3$	-	2	3	3	4	2
20.	Pm_{10}	$\mu g/m^3$	-	5	6	6	7	5
21.	Ex	% Lel	-	0	0	0	0	0
22.	Sound Level	dB	90	73.1	64.6	74.4	62.4	53.9
23.	AQI	-	Excellent	Good	Excellent	Excellent	Good	Excellent

Plate 4.7: In-situ Measurement of Noise at Alkamawa Wheat Farm

4.2.6 Soil Quality Results of Alkamawa Wheat Farms

Soil samples were collected at different locations in the study area. At each sampling location, representative soil samples were collected at depths of 0- 15 cm (top soil) and 15–30 cm (sub soil). The soil was collected with a steel soil auger and transferred into a clean bucket where it is sub-sampled into different sampling containers. Each soil sample was properly labelled with a unique code to avoid possible miss-up and later transferred to Pollution Control laboratory for analysis. The coordinates of the sampled soils are outlined in while their spatial distribution is presented in shows the soil sampling activities. The results of physical and chemical parameters of surface soil at Alkamawa wheat farms are presented in Table 4.11.

The pH value recorded in the soil samples reflected a fairly acidic and neutral at top soil medium indicating a humid environment and arable soil type. The moisture contents of soil samples in the study area ranged from 1.79 % to 2.06 %. The amount of moisture in soil depends on many factors which include soil type, soil organisms, soil organic matter and climatic conditions.

Plate 4.8: In-situ Measurement of Soil Sample at Alkamawa Wheat Farm

The concentrations of Mg, Ca, Na, and K recorded in soils from the study area fall within natural occurrence levels for tropical soils as prescribed by Alloway (1991). Similarly, no heavy metal pollution was recorded except in cases of Nickel (Ni) and Copper (Cu) which had traces of 0.011-0.030 and 0.011 – 0.030mg/kg for both top and subsoil. Among the heavy metals analysed in the soil samples, Cadmium (Cd), Chromium (Cr) and Mercury (Hg) had no traces. Copper (Cu) which were detected in any of the soil samples at 0.570 for the top soil and 0.102 for subsoil. Other heavy metals such as Nickel (Ni) and Copper (Cu) were recorded in trace amounts, below the prescribed limits for unpolluted soil. No hydrocarbon

pollution and THC were recorded in the soil samples. Oil and grease were not detected in any of the soil samples.

Table 4.11 Physicochemical and microbial parameters of top-soil (0-15) cm and sub-soil (15-30cm) at Alkamawa wheat farms (AWFs)

S/N	Parameters	Unit	Limits	Top Soil AWF_{S1}	Sub Soil AWF_{S2}
1.	pH	-	-	7.02	6.31
2.	Conductivity	µs/cm	-	39.14	122.2
3.	Moisture content	%	-	1.79	2.06
4.	Colour	-	-	Brownish	Reddish Brownish
5.	Texture	mm	-	Loam	Loam
6.	TOC	%	-	1.06	1.94
7.	Permeability	cm/hr	-	2.04	1.82
8.	Erosion Potential	-	-	N/A	N/A
9.	Grain Size	mm	-	0.80	0.67
10.	Chloride	mg/kg	-	12.43	15.02
11.	Nitrate	mg/kg	50	1.87	3.83
12.	Sulphate	mg/kg	-	4.21	2.48
13.	Phosphate	mg/kg	-	0.22	0.92
14.	Oil & Grease	cm3	-	0	0
15.	THC	mg/kg	-	ND	ND
16.	Cupper (Cu)	mg/kg	5 – 500	0.570	0.102
17.	Lead (Pb)	mg/kg	2 – 20	0.10	0.00
18.	Cadmium (Cd)	µg/kg	0.03 – 0.30	0.00	0.00
19.	Chromium (Cr)	mg/kg	-	0.00	0.00
20.	Mercury (Hg)	µg/kg	-	0.00	0.00
21.	Nickel (Ni)	mg/kg	5 – 500	0.011	0.030
22.	Sodium (Na)	mg/kg	-	21.3	5.00
23.	Magnesium (Mg)	mg/kg	-	1.24	0.67
24.	Calcium (Ca)	mg/kg	-	2.27	2.02
25.	Potassium (K)	mg/kg	-	0.68	1.17
26.	Hydrocarbon Utilizing Bacteria $x10^2$	Cfu/g	NS	NS	NS
27.	Hydrocarbon Utilizing Fungi $x10^1$	Cfu/ml	NDS	NS	NS

4.2.*7* Water Quality Results at Yadakwari Tomato Farms

Groundwater and Surface Water (Dry Season)

Results of the measured groundwater and surface water quality parameters at the selected sampled farms are presented in Table 4.12. The groundwater and surface waters sampled are slightly acidic with a pH range of 6.1 to 6.1 respectively. Dissolved Oxygen (DO) in the groundwater and surface water were 5.82 and 4.91 mg/L indicating that there was more DO in groundwater than in surface water in the dry season. The mean DO is within the World Health Organisation (WHO) limit of 7.5 mg/L. The TDS values of 21.0ppm and 26.3ppm for

both underground and surface waters were within the limits of 500ppm. Electronic Conductivity (EC) was within the tolerance level recommended by the WHO. The groundwater and surface water temperatures were 27.3^{0}C and 29.4^{0}C and do not breach the NSDWQ limit of 35^{0}C. No heavy metal pollution and hydrocarbons were recorded in the both underground and surface water samples when compared with the FMEnv and WHO maximum permissible limits, as indicated in Table 4.12.

Table 4.12: Underground water and surface water physicochemical parameters of Tomato Farms at Yadakwari, Garun Malam, Kano State

S/N	Parameters	Unit	Limit	Underground Water	Surface Water
1.	Odour	-	-	Odourless	Odourless
2.	Colour	-	-	Colourless	Colourless
3.	pH	-	6.5 – 8.5	6.1	6.1
4.	Electrical Conductivity	µs/cm	1000	39.7	40.2
5.	Turbidity	NTU	5	1.21	2.09
6.	Temperature	^{o}C	NS	27.3	29.4
7.	TDS	ppm	500	21.0	26.3
8.	TSS	mg/L	-	3.2	4.8
9.	DO	mg/L	7.5	5.82	4.91
10.	BOD	mg/L	-	3.6	3.5
11.	COD	mg/L	-	13.47	07.86
12.	Salinity	ppt	NS	0.0	0.1
13.	Ammonia	mg/L	-	0.231	0.063
14.	Nitrate	mg/L	50	11.33	4.92
15.	Phosphate	mg/L	-	0.511	1.273
16.	Sulphate	mg/L	400	4.16	9.66
17.	Calcium	mg/L	75 – 200	25.91	08.92
18.	Magnesium	mg/L	30	1.77	2.03
19.	Sodium	mg/L	NS	14.632	29.010
20.	Potassium	mg/L	NS	0.631	1.403
21.	THC	mg/L	0.05	ND	ND
22.	Zinc	mg/L	5	0.0372	0.0231
23.	Cupper	mg/L	0.01	0.0	0.0
24.	Iron	mg/L	1	0.0	0.003
25.	Mercury	µg/L	Nil	0.001	0.0
26.	Lead	µg/L	0.05	0.0	0.000
27.	Chromium	mg/L	Nil	0.00	0.0
28.	Nickel	µg/L	NS	ND	ND
29.	Total Coliform	Cfu/ml	NS	ND	ND
30.	Hydrocarbon Utilizing Bacteria	Cfu/ml	NS	ND	ND
31.	Total Heterotrophic Bacteria	Cfu/ml	NS	ND	ND
32.	Total Heterotrophic Fungi	Cfu/ml	NS	ND	ND

4.2.8 Air Quality and Noise

In situ air quality and noise measurement was carried at a total of 5 locations across the entire sampled farms. For air quality, the parameters measured include Nitrogen Oxide (NO), Nitrogen Dioxide (NO_2), Sulphur Dioxide (SO_2), Hydrogen Chloride(HCL),Total Volatile Organic Carbon (TVOC), Carbon Dioxide (CO_2), and Carbon Monoxide (CO). In situ measurement was conducted using a pre-calibrated Crown Corn Gassman air quality equipment. The results are presented in Table 4.14. In addition, Particulate matter (PM) was measured in situ using Particle Meter/Particle Counter. Three mass ranges of particulates Measured were $PM_{2.5}$, $PM_{1.0}$, PM_{10} and Total Particulate Matter (TPM). Also, atmospheric parameters (temperature and relative humidity) were determined. The results are presented. Average noise levels at each monitored farm were taken with a digital, battery-powered, Sound Pressure Level (SPL) meter (Sound Meter). The results of the ambient noise measurements are presented in Table 4.13.

Plate 4.9: In-situ Measurement of Air at Yadakwari Tomato Farm

Summary of the gaseous air pollutants concentration at the selected sampled tomato farms, including the in-situ weather conditions (relative humidity (RH) and atmospheric temperature) is shown. The NO_2 was detected in five Tomato Farm tomato farms sampled and the value (2.16ppm) was higher than the regulatory limit of 0.10 ppm. Major factor that could be responsible for the high NO_2 was combustion from vehicles due to proximity of the farm to the main road. Meanwhile, CO was detected in all the sampled farmsbut at a level lower than the limit provided by the FMEnv. NO was not detected in all the sampled Tomato farms at Yadakwari. Furthermore, TVOCwas also not detected as it has a value of 0.00 ppm in all the farms, therefore not breaching the FMEnv's limit of 1.60 ppm. Mean RH was 15% while mean air temperature was 29.64°C.

Particulates were detected in all the sampling locations however; there was no record where TPM FMEnvlimit of 1-hour averaging value of 600 g/m^3 was breached in all the sampled tomato farms.

Table 4.13: In-situ air quality and noise level assessment carried out at Tomato farms at Yadakwari, Garun Malam, Kano State

S/N	Parameters	Units	FMEnvLimit	YTF_A	YTF_B	YTF_C	YTF_D	YTF_E
1.	Latitude	-	-	11.70449	11.7043	11.70437	11.70882	11.623
2.	Longitude	-	-	8.42198	8.42237	8.42256	8.42362	8.4348
3.	Altitude	m	-	510	507	512	511	496
4.	Angle	0	-	28^0NE	217^0SW	189^0SW	133^0SE	148^0SW
5.	CO	Ppm	10.0	0.03	0.02	0.02	0.02	0.02
6.	CO_2	ppm	NS	462	469	471	544	562
7.	SO_2	ppm	-	0.00	0.00	0.00	0.00	0.00
8.	NO_2	ppm	0.10	2.16	0.82	1.37	1.40	0.93
9.	NO	ppm	0.06	0.01	0.00	0.00	0.00	0.00
10.	O_2	%Vol.	-	20.9	21.3	21.9	20.9	20.6
11.	H_2S	ppm	-	0.002	0.000	0.000	0.000	0.001
12.	HCN	ppm	NS	0	0	0	0	0
13.	Cl_2	ppm	2.5	0.831	0.711	0.062	0.741	0.321
14.	Temperature	^{0}C	1.60	29.5	29.6	30.5	29.6	29.0
15.	TVOC	mg/m^3	NS	0.00	0.00	0.00	0.00	0.00
16.	HCHO	mg/m^3	Ambient	0.00	0.00	0.00	0.00	0.00
17.	Relative Humidity	%	-	15	15	15	15	15
18.	Pm 2.5	µg/m^3	-	9	8	8	9	8
19.	Pm 1.0	µg/m^3	-	2	3	1	2	3
20.	Pm $_{10}$	µg/m^3	-	3	1	2	4	3
21.	Sound	dB	-	59.1	52.2	56.6	60.6	58.9
22.	Ex	%Vol.	90	0	0	0	0	0
23.	AQI	-	-	Excellent	Excellent	Excellent	Good	Excellent

Plate 4.10: In-situ Measurement of Noise at Yadakwari Tomato Farm

4.2.9 Soil Quality

Soil samples were collected at different tomato farms at Yadakwari.. At each sampling location, representative soil samples were collected at depths of 0- 15 cm (top soil) and 15–30 cm (sub soil). The soil was collected with a steel soil auger and transferred into a clean bucket where it is sub-sampled into different sampling containers. Each soil sample was properly labelled with a unique code to avoid possible miss-up and later transferred to Pollution Control laboratory for analysis. The pH values recorded in the soil samples reflected a slightly acidic medium indicating a good soil for tomato production.

Plate 4.11: In-situ Measurement of Soil at Yadakwari Tomato Farm

The moisture contents of soil samples in the study area ranged from 10.4 % to 15.3 %. The amount of moisture in soil depends on many factors which include soil type, soil organisms, soil organic matter and the climatic conditions.

The concentrations of Mg, Ca, Na, and K recorded in soils from the study area fall within natural occurrence levels for tropical soils as prescribed by Alloway (1991). Similarly, no heavy metal pollution was recorded in the soil samples. Among the heavy metals analysed in the soil samples, Nickel (Ni) recorded a range of 0.01mg/kg to 0.011 mg/kg in the top and sub soils respectively. This could be due to the geological formation of the study area. Mercury (Hg), Cadmium (Cd), Cupper (Cu) and Chromium (Cr) were not detected in any of the soil samples. No hydrocarbon pollution was recorded in the soil samples. THC, Oil and grease were not detected in any of the soil samples. The measured THC values were below the prescribed limit of 50 mg/kg.

Table 4.14: Physicochemical and microbial parameters of top-soil (0-15) cm and subsoil (15-30) cm at Yadakwari, Garun Mallam, Kano State

S/N	Parameters	Unit	FMEnv Limit	BRF_T (0-15)cm	BRF_s (15-30)cm
1.	pH	-	6.5 – 8.5	5.79	6.08
2.	Conductivity	µs/cm	1000	44.3	56.0
3.	Moisture Content	%	-	10.4	15.3
4.	Colour	-	-	Brownish	Brownish
5.	Texture	-	-	Loamy	Clay
6.	TOC	mg/kg	%	2.88	1.88
7.	Permeability	cm/hr	-	0.66	0.01
8.	Erosion Potential	m/s	-	0	0
9.	Grain Size	mm	-	0.462	0.021
10.	Chloride	mg/kg	-	9.77	12.30
11.	Nitrate	mg/kg	-	1.83	3.56
12.	Sulphate	mg/kg	-	0.49	1.31
13.	Phosphate	mg/kg	-	0.73	0.22
14.	Oil & Grease	cm3	-	ND	ND
15.	THC	mg/kg	50	ND	ND
16.	Cupper	mg/kg	5 – 500	0.22	0.291
17.	Lead	µg/kg	2 – 20	0.00	0.00
18.	Cadmium	µg/kg	0.03 – 0.30	0.00	0.00
19.	Chromium	mg/kg	-	0.00	0.00
20.	Mercury	µg/kg	NS	0.00	0.00
21.	Nickel	mg/kg	5 – 500	0.011	0.01
22.	Sodium	mg/kg	-	19.23	4.06
23.	Magnesium	mg/kg	-	1.78	1.16
24.	Calcium	mg/kg	-	2.29	2.02
25.	Potassium	Cfu/ml	-	4.07	4.41
26.	Hydrocarbon Utilizing Bacteria $x10^2$	Cfu/ml	-	ND	ND
27.	Hydrocarbon Utilizing Fungi $x10^1$	Cfu/ml	-	ND	ND

4.2.10 Biological Environment

Flora and Fauna

The vegetation within and surrounding vicinity environments at Bugau, Alkamawa and Yadakwari comprises of trees, herbs, shrubs and grasses. Major plant and animal species found in the area are presented in Tables 4.16 and 4.17. The ecosystem recorded mammals such as cattle, sheep, goat, rabbits; reptiles such as snakes; insects such as flies, spiders, grasshoppers, termites, worms; birds, such as pigeon, chicken, fowls, ducks; amphibians like frogs, toads, chameleons and Molluscs.

Plate 4.12: Flora Vegetation

Table 4.15: Plant species found around rice, wheat and tomato farms in Kano

SN	Botanical Name	English Name	*Hausa Name*
1	*Balanites aegyptica*	Desert date	*Aduwa*
2	*Adensonia digitata*	Baobab	*Kuka*
3	*Jatropha curcas*	Physic nut	*Bini da zugu*
4	*Ipomoea asarifolia*	Stream goard	*Duman rafi*
5	*Osimum basilicium*	Scent leaf	*Daddoya*
6	*Acacia dudgeon*	Tree	*Dakwara*
7	*Vitex doniana*	Black plum	*Dinya*
8	*Centaurea praecox*	Thistle	*Kaba*
9	*Faidherbia albida*	Winter thorm	*Gawo*
10	*Acacia nilotica*	Egyptian mimosa	*Bagaruwa*
11	*Ficus ovate*	Gutta tree	*Gamji*
12	*Andropogon gayanus*	Shrub grass	*Gamba*
13	*Momordica balsamina*	Balsam apple	*Garafuni*
14	*Borassus aethiopum*	Fan Palm	*Giginya*
15	*Hyphaene thabaica*	Dum palm	*Goriba*
16	*Moringa olifera*	Horse raddish tree	*Zogale*
17	*Tamarindus indica*	Tamarind	*Tsamiya*
18	*Diallium guineense*	Monkey tamarind	*Tsamiyar biri*
19	*Detarium senegalense*	Nil	*Taura*
20	*Imperata cylinderice*	Spear grass	*Tofa*
21	*Senna occidentalis*	Coffee senna	*Tafasa*
22	*Vernomia colorata*	Bitter leaf herb	*Shiwaka*
23	*Hibiscus sabdarifa*	Herb	*Sure*
24	*Cassia singueana*	-	*Runhu*
25	*Guiera senegalenses*	-	*Sabara*
26	*Ceiba pentendra*	Silk cotton tree	*Rimi*
27	*Senna occidetalis*	Coffee senure	*Rai-dore*
28	*Lophira alata*	Men oil tree	*Namijin Kadanya*
29	*Erythrina senegalensis*	Coral tree	*Minjirya*
30	*Mangifera indica*	Mango	*Mangwaro*
31	*Anogeissus leiocarpus*	Chew stick tree	*Marke*
32	*Ziziphus abyssinica*	Catch thorn	*Mesarya*
33	*Khaya senegalensis*	Mahogany	*Madaci*
34	*Lawsonia inermis*	Henna	*Lalle*
35	*Corchorus trilocularis*	Jude	*Lalo*
36	*Penniseturm polystadion*		*Kyasuwa*
37	*Cynodon dactylon*	Drugs tooth grass	*Kirikiri*
38	*Cenchrus bifloris*	Burs	*Karangiya*
39	*Mimosa piigra*	-	*Kaidaji*
40	*Diospyros mespiliformis*	-	*Kanya*
41	*Piliostigma thonningii*	-	*Kargo*
42	*Vitallaria paradoxa*	Shea	*Kade*

Animals

Table 4.16: Animal species found around rice, wheat and tomato farms in Kano

SN	Botanical Name	English Name	*Hausa Name*
	Birds		
1	*Bubulcus ibis*	Cattle egret	*Balbela*
2	*Lamprotornis pulchur*	Chestnut bellied	
3	*Billed firefrich*	Red	*Benu*
4	*Glandicidium perlutum*	Owl	*Mujiya*
5	*Streptopelia senegalensis*	Dove	*Kurciya*
6	*Hankaka*	Black crowned night leron	*Hankaka*
	Amphibian		
7	*Egyptia toad*	Sclerophyr regularies	
	Reptiles		
8	*Agama agama*	Rainbow agama	*Kadangare*
9	*Trachylepis perrotetii*	Fire sided skink	*Kulba*
10	*Varanus exanthematious*	Savannah monitor	*Guza*
11	*Telescopus variegetus*	West African cat Snake	*Maciji*

4.2.11 Forest and water resources

Kano State has a lot of forest resources which are now encroached due to conversions to farmlands and settlements. According to Mohammed *et al.,* (2018) changes have occurred on the boundaries of the reserves indicating a reduction in the areal extents, variations in tree species density and types. The reasons for the reduction could be due to factors such as poverty, climate change, illiteracy and medicinal benefits. Abubakar *et al.*, (2018) reported that about 31 species of medicinal plants belonging to 19 families are threatened. Also, records from Forestry Management, Control and Administration Unit of Kano State Ministry of Environment (KSME, 2019) show that out of twelve (12) forest reserves in the State, one (8.3%) was converted to farmlands, five (42%) were dereserved, four (33%) were encroached, one (8.3%) was converted to a dam and one (8.3%) was converted to a game reserve. Also, almost all the communal forest areas in the State have been encroached. They also reported that that most of the indigenous trees are being wasted with little replacements. The endangered species of trees now scattered in the State include, among others, *Galdhervia albida* (Gawo), *Adansonia digitata* (Kuka), *Acacia senegal* (Dakwara), *Anogeisus veiocarous* (Marke), *Guirea senegalensis* (Sabara), *Azadirachta indica* (Darbejiya), *Cieba pentandra* (Rimi) and *Ficus thonningii* (Chediya). All these are found mostly in the rural areas, while exotic species of trees, shrubs and flowers are found in the urban centres.

Water bodies found in the State include: Bagauda, Watari, Dankwai, Gari, Guzu-guzu, Jakara, Kafinchiri, Kusalla, Magaga, Ruwan kanya, Sabuwar tasha, Tiga, Tomas, Challawa and Tudunwada. These water bodies are used for irrigation, fishing, transportation and domestic uses.

4.3 Socio-Economic Environment

The survey determined demographic, educational as well as economic variables of relevance and which can serve as baseline information for the planning, implementation and monitoring of the project. The general results are presented in Table 4.17

Table 4.18 Demographic and other attributes of the rice, wheat and tomato farmers in Kano

S/N	Variable	Percentage (%)	Description
1.	Age Range		Age is among the important human attributes that classifies a person as young, middle-aged or old. The results reveals that majority (52%) of the PAPs fall within the age range of 31-50 years, implying that they are mostly physically and mentally agile to participate in decision making that would enhance their productivity and improve their standard of living. Only about 14% of the PAPs were found to be over 60 years.
	21–30	14	
	31–40	24	
	41–50	28	
	51–60	20	
	>61	14	
2.	Marital Status		Marital status is another important socio-economic variable which makes a person more responsible to his family needs. Results reveal that majority (94%) of the PAPs were married. Only about 3% were single. The results imply that the PAPs have a family burden bestowed on them and may therefore be ready to accept any developmental project that would improve the standard of living of their family members.
	Single	3	
	Married	94	
	Divorced	1	
	Widowed	2	
3.	Gender		Gender refers to the segregation of human beings according to their social roles as either male or female. Results of the gender composition of the PAPs revealed that 85% were males, while the remaining 15% were females. This calls for more women involvement in any project targeting improvement in livelihood (especially enhancing employment and income).
	Male	85	
	Female	15	
4.	Level of Education		From the survey findings on education level of the PAPs, about 34% have no formal education, 37% attended primary school, while 24 % went to secondary school and only 4 % had tertiary education. The literacy level was generally low, showing there is less consideration to western education despite Government efforts at providing schools and services.
	Primary	37	
	Secondary	24	
	Tertiary	4	
	No Formal Education	34	
5.	Occupation		The occupational distribution of the PAPs presented in Figure 9 indicates that majority are farmers (75%), traders were 18%, Civil servants constitute 3% and the remaining were students and others. The results indicate that the project affected persons are mostly farmers and any project that is brought to the area would really affect the farmers either positively or otherwise.
	Farming / Rearing	75	
	Trading	18	
	Civil Servants	3	
	Students	2	
	Others	2	
6.	Monthly Income (Naira)		The income distribution of the affected persons (in naira) is presented in Figure 10. The results show that majority of them (54%) earn income in the range of ₦21,000-₦30,000.00 per month. This is followed by 17% in the range of ₦31,000 to above ₦60,000 per month. Impliedly, they earn above the national minimum wage prevalent in the country. Those in the range of the minimum wage and below form the minority with 10% in the lowest income range of ₦1,000 -₦10,000 per month.
	1,000 – 10,000	10	
	11,000 – 20,000	15	
	21,000 – 30,000	21	
	31,000 – 40,000	17	
	41,000 – 50,000	12	
	51,000 – 60,000	10	
	>61,000	15	
7.	Household Size		The socioeconomic data show that majority (59%) of the project affected persons have large household sizes ranging between 7 and 10; 26 % were in the range of 5-7 and 10 % have household size above 10 members. The household size of 2 - 4 persons is the lowest. Impliedly, the PAPs have larger families to cater for and would engage in any lawful activity that would enhance the level of their income.
	2-4	5	
	5-7	26	
	7-10	59	
	>10	10	
8.	Expectation on the Project		The findings also show that almost all the affected persons are favorably disposed to the project. Majority of the PAPs (94%) have positive expectations of the project, the remaining 6% have remained neutral. Impliedly, the PAPs have strong expectations that the activities of the project would deliver positive results to them.
	Positive Expectation	94	
	Neutral	6	
	Negative Expectation	0	

9.	Membership to cooperative		The results also indicated that majority (89%) of the affected persons have joined cooperative societies, while few (11%) have not joined. This indicates that the affected persons have a sense of unity and group dynamism which will assist them in cohesively pursuing a common goal.
	Member	89	
	Non member	11	
10	Source of income	Crop production (81%) Annual production (8%) Trading (4%) Civil service (7%)	The results reveal that the people living in the area are farmers majority of whom produce crops only. There are some of them that combine farming with trading and civil service. This indicates that there exist other forms of occupations which serve as alternative source of income to the farmers.
11.	Awareness about existing of agricultural projects in the area	Aware (100%)	All the farmers in the study area confirmed that they are aware of other agricultural projects in the area. Some projects include; Agricultural Transformation Agenda Support Program (ATASP) (where modern market infrastructure were built), Anchor Borrower, ICRISAT, WACOT (supply of pesticides, sprayers and out-grower support) and SASAKAWA.
12.	Availability of Agro-processing plants	Rice (72%) Tomato (21%) Wheat (7%)	There are rice processing plants in majority (72%) of the areas, with split or combined equipment. However, the tomato and wheat processing plants are mostly situated in urban centers. Impliedly, transport of paddy is much reduced due to the availability of processing plants within the vicinity.
B. Accessibility			
13.	How is the area accessibility	Feeder Road (38%) Tarred Road (57%) Footpaths (5%)	The results reveal that majority of the areas are accessible through tarred roads (57%), while about 38% of the areas are accessed through feeder roads. Only 5% of the areas are accessed through footpaths. Motorcycles and donkeys are used on the footpaths. Impliedly, agricultural produce could be transported easily in most of the areas under study.
14.	Availability of commercial and private transport	Commercial (92%) Private (8%)	These areas are accessible using commercial (92%) vehicles while only 8% of the residents of the areas use private vehicles.
C. Education			
15.	Schools in the communities	Islamiyya (100%) Quranic (100%) Primary/Basic (100%) Senior Secondary (72%) Tertiary (4%)	In terms of traditional and religious education, in all the communities there are islamiyya and Quranic Schools for formal education, there are primary/basic Schools in all the communities within the study area. There are also senior secondary schools in 72% of the areas. However only 4% of the areas have presence of tertiary schools. Most of the tertiary schools are located in the urban centers.
16.	Formal Schools enrolment and dropout rates	Enrolment (80%) Dropout (10%)	Rates of school enrolment in the areas read up to 80% while school dropout reach about 10%, especially among girl children. If could be deduced that school enrolment in the rural areas has improved tremendously, while the rate of dropout has reduced. Girl-child education has also improved
D. Health			
17.	Availability of health Facilities	Cottage Clinic (100%) Dispensaries (100%) PHC (52%) Patient Medicine Stores (100%)	The health care facilities available in the areas include dispensaries and private patient medicine stores which are found in all the communities, while 52% of the communities have Primary Health Care Units. There are no private hospitals in most of the rural areas.
18.	Prevalent Diseases	Malaria (87%) Typhoid (49%) Dysentery (16%)	The most prevalent diseases affecting the people in the study area are malaria (87%), typhoid (49%), dysentery (16%), tuberculosis (3%), ulcer (31%), urinary traits infection mostly the elderly (21%). Majority of the people are aware of HIV/AIDS and Covid-19 but reported that they have no cases of these diseases

		Tuberculosis (3%) Ulcer (11%) Urinary Traits Infections (21%) HIV/AIDS (0%) Covid-19 (0%)	and mostly people affected are shy to disclose their status.	
E. Housing				
19.	Types of houses	Mud (33%) Mud with iron roof (41%) Concrete (Block) (23%) Threatened (3%)	The type of housing in the study area reocal that mud houses with iron sheet roofing are more prevalent in the study area (41%) while houses mode of concrete block with iron roofing, which seem to be modern buildings cover about 23%. Old fashioned theteched houses are fast diminishing and phasing out with only 3%. The result indicate that there is real change in the housing types and patterns in the areas.	
F. Gender based violence				
20.	Rate of prevalence of GBV cases	Rape Forced Prostitution Sexual Abuse Woman Trafficking	Low Low Low Low	The rate of rape, forced prostitution, sexual abuse and woman trafficking were all perceived to be low with the communities. However, these inotances are not readily reported and discussed in the communities.
21.	Reports of GBV incidences		Most of the GBV incidences are reported to the traditional institutions, most of the members attributed the low prevalence of GBV cases due to their diligence in general family counselling, reduction in hawking by children, disallowing minors to wonder avoid at odd periods of the day (especially early, middle, and late hours of the day), increased school enrolment and of local government vigilante group for surveillance.	
22.	Satisfaction with the way GBV issues are handled.	Yes (100%)	All the members of the communities are satisfied by the way and manner GBV cases are handled and resolved by the traditional rulers. Some few cases are referred to the police for prosecution.	
G. Rating of occurrences of these Factors if Road Or Processing Plant infrastructure are sited in your Area				
23.	Reduction in vegetation Reduction in farmland Flooding Erosion Air Pollution Water Pollution	92% moderate 76% minor 72% major 76% major 52% minor 59% minor	The community members expressed that when siting projects for road constructions and establishment of agro-processing plants, the major concern are flooding and erosion.	

Table 4.18: Awareness of APPEALS project, Strengths, weaknesses, opportunities and threats

S/N	Variables	Description
24.	Sporting spaces	There are enough sporting spaces in the areas. These allow the members of the communities to improve their health b engaging in physical exercises.
25.	Nature of tenure	All the houses were owned by the occupiers as their personal property while very occupants stay as free-rent occupants as the houses are family owned or owned by a relative who give it free to occupant.
	Benefits of establishing roads or processing plant projects in the area	Major benefits perceived by the community members include provision of employment, increase output, increase profit level, improvement in nutrition, and increase in income level and reduction in crimes.
	Awareness of APPEALS project	Majority of the community members were aware of the Agro-processing, Productivity Enhancement and Livelihood Improvement Support (APPEALS) Project and its activities. They generally have positive opinion and expectations of the project. They believe that the project would affect them positively by improving and increasing their farm outputs, incomes access to technologies, inputs and improved skills.
	Strengths, opportunities, and weaknesses the communities have in relation to APPEALS project and its related activities.	**Strengths:** - Availability of labor - Adequate farming skills - Availability of input markets - Availability of output markets - Unity and cohesion among community members - Good leadership - Availability of rental accommodation - Good road network **Weaknesses:** - Incessant theft and burglary - Drug abuse among youths **Opportunities:** - Availability of processing plants in the communities - Availability of manure from farm wastes - Transportation **Threats:** - Flooding - Erosion - Infestation by birds and insects - External pastoralists - Late supply of inputs - Erratic supply of electricity - Limited pipe borne water

4.3.1 Stakeholders Consultations

During the conduct of the ESIA, public consultations were carried out with respective beneficiary/farming communities and other stakeholders. The meetings were conducted with community members (including women and youths' representatives), staff of NESREA, Kano State Ministries of Agriculture and Natural Resources, Women Affairs, Environment; staff of APPEALS project; and Non-governmental Organisations. The purpose of consultations was: (i) to generate a good understanding of the project by all stakeholders; (ii) to enhance ownership of the project by local leadership, the community and local farmers; (iii) to understand people's expectations about the project; (iv) to understand and characterize potential environmental, social and economic impacts of the project; (v) to enhance local benefits that may accrue from the project; and (vi) to enable stakeholders involved in the project to provide views, hence participating in or refining project designs. In addition, site specific investigations were also conducted to gain insight to the likely impacts of the project activities on the environment. The issue of Gender Based Violence (GBV) as cross cutting

was also discussed at the community level and with stakeholders directly involved to obtain a broad picture. The views and comments of the public have been incorporated to the extent possible and are likely to influence the design as well as the locations of the proposed projects and infrastructure development. The following results of consultations are presented below:

Consultations with community members

In all the communities consulted (see Annex 1), the estimated age distribution during the FGDs indicated that majority of the people (over 60%) were in the active age categories and can therefore participate productively in any economic and development activities. In terms of population distribution, the results indicated the dominance of females with most communities reporting about 60% to 40% as females to males ratio. Despite the large proportion of women and youths, their involvement in economic activities and decision making is inadequate. There are about 2% of the community members who are people living with disabilities, most of whom do not have any reliable source of livelihood.

In terms of engagement in economic activities and occupations, majority of the people in the rural communities are crop farmers (80%) with sorghum, millet, rice, maize, tomato, onion and wheat as the major crops produced. Other economic activities mentioned include; livestock rearing, agro-processing and marketing, petty trading and provision of farm labour. In the urban communities, majority of the people are traders, followed by food processing, agro-processing and skilled work.

During the consultations environmental issues were discussed of which the general assessments indicated good condition in terms of sanitation, air and water quality in all the rural communities interviewed. In the urban communities people generally complained about poor state of sanitation and poor quality of air and water due to pollution caused by industrial, traffic and other human activities.

Social issues such as Gender Based Violence (GBV) and conflicts were also discussed. In the rural communities, the incidence of gender based violence is not common. In the urban communities, GBV issues used to arise in few occasions and are usually addressed using the traditional and formal hierarchy. Most of the community members attributed the less prevalence of GBV cases due to their diligence in general family counselling, reduction in hawking by children, avoidance of allowing minors to wander around at odd periods of the day (especially early, middle and late hours of the day), increased school enrolment and provision of local vigilante groups for surveillance.

The occurrence of resource conflicts especially between farmers and pastoralists during the rainy and dry seasons were discussed in some of the rural communities interviewed. Such conflicts (crop damages) when they occur are settled amicably without violence through the traditional leaders and compensations are usually paid to the party affected.

In terms of formal education, school enrolment reaches up to 80% with a school dropout level of 10% especially in rural areas. There are public basic and secondary schools in all the

communities interacted with. In the urban centres, there are many private schools. Interestingly, there are some tertiary institutions and vocational centres located in some rural communities like Rano, Kura, Bichi and Dawakin Tofa, though, majority of the institutions are situated in the urban centres.

The health conditions and status of the people in the communities consulted were generally good. The available health facilities in the rural communities usually include Local Primary Health Care Units, dispensaries and Private Patent Medicine Stores. Major diseases commonly occurring in the communities were generally, Malaria Fever, Typhoid Fever, Ulcer and some Urinary Tract infections. The people are also aware about other diseases such as HIV/AIDS, Avian Influenza and COVID-19.

Majority of the community members were aware of the Agro-Processing, Productivity Enhancement and Livelihood Improvement Support Project (APPEALS) and its activities. The people consulted in the communities generally have positive opinion and expectations of the APPEALS project. They believe that the project would affect them positively by improving and increasing their farm outputs, incomes, access to technologies, inputs and improved skills.

The communities have prior experiences with other projects such as Agricultural Transformation Agenda Support Program (ATASP) (where a modern market infrastructure was built), Anchor Borrower, ICRISAT, WACOT (supply of pesticides, sprayers and out-grower support) and SASAKAWA (technology for maize production).

Consultations with staff of Ministry of Agriculture and Natural Resources/ APPEALS

The staff of MANR and APPEALS were consulted. They indicated their resolve to undertake the project components to the best they could. Most of them have the requisite trainings on similar projects in the State. They also assisted in providing information relevant to the ESIA study; and have assisted in the stakeholder engagements.

Consultations with NESREA staff

The NESREA is a Federal Agency under the Federal Ministry of Environment, established by its establishment Act in 2007 and saddled by law to regulate and enforce environmental laws. According to the staff (led by Engineer Sahalu Ubale, 08036074453), the key elements of the agency's enforcement strategies include: inspection, compliance monitoring, negotiation, legal action and prosecution.

The methods of enforcement include: issuance of permit, prohibition and enforcement notices; variations of license conditions, implementing the 'polluter pays' principles, suspension and revocation of permits and licenses; and injunctions to carryout remedial works. The staff undertake in-situ assessment of the level of pollutions by the industries, including agro-processing plants and any site where pollutants in gaseous, liquid and solid forms are released.

Consultations with the staff of Kano State Ministry of Women Affairs

The staff of the KSMOWA, who serve at the *WARAKA* centre, which is the only Sexual Assault Referral Centre (SARC) in the State, situated at Murtala Mohammed Specialist Hospital, Kano were consulted. According to the Counselling Officer, who is a lady (Halima BB Faruk, 08065762620), the centre is jointly manned by Medical Doctors from the State's Ministry of Health; Lawyers from Ministry of Justice, Counsellors from Ministry of Women Affairs, Non- Governmental Organisations and the Police. Those staff handle any case of Gender Based Violence brought to the centre and offer services such as medical treatment, forensic and legal. The Counselling Unit offers other services such as referral to ACT Unit of the hospital if the survivor is infected with HIV/AIDS, liaising with NAPTIP and if the survivor needs temporary accommodation, they provide lodge at the State VVF hostel. The centre also empowers less privileged survivors. The Counselling Officer revealed that one (1) out of four (4) girls; and one (1) out of ten (10) boys are sexually abused. She also reported that about 60 cases of GBV are presented to the centre monthly, most of which are brought from the Metropolitan Local Government Areas. Most of the survivors are minors including girls and boys. She also attributed the rise in GBV cases to the hike in unemployment and drug abuse among the youths. The staff expressed concern over the inadequacy of the facilities and manpower in the centre. Also, some of the survivors are from poor families, that could not afford even transport fares to-and fro the centre. The centre has to provide for those immediate needs of those survivors.

Consultations with the staff of Kano State Ministry of Environment

The staff of the Ministry of Environment were consulted (led by Muhammad Auwal, 08036383760) and they expressed dismay over the incessant deforestation of the reserved forests and the communal forest areas in the State. Records show that out of twelve (12) forest reserves in the State, one (8.33%) was converted to farmlands, five (42%) were de-reserved, four (33%) were encroached, one (8.33%) was converted to a dam and one (8.33%) was converted to a game reserve. Also, almost all the communal forest areas in the State have been encroached. They also reported that most of the indigenous trees are being wasted with little replacements.

Consultations with the Non-Governmental Organisations (NGOs)

There are several non-governmental organisations in Kano that aim at protecting the rights of the less privileged in the society. The NGOs target less privileged, children and orphans. The consultations were carried out with the Chairmen of the Human Rights Foundation of Nigeria (HURFON, 08090979949) and Human Rights Network (HRN). Both organisations reported that they receive GBV cases from parents, traditional rulers, especially if the survivor is less privileged. They have the license under the law to follow up any GBV case reported to them, which requires their interventions. they struggle to see that justice is meted to the parties, both accused and the victim. They liaise with other government agencies like NAPTIP, FIDA and the SARC Centre. They ensure that culprits are apprehended by the police and arraigned before the court. They also appear in courts of law where such cases are heard.

General Observations from the Consultations

- There is relative paucity of engagements of women, youths and people living with disabilities in the decision making and economic activities in the communities.

- There is prevalence of gender based violence cases especially in the urban centres which are not disclosed by the community members. This is evident because most of the communities consulted reported that there was no case of GBV, but the *Waraka* centre reports disagree with this, as about 60 cases are reported every month.

- Forest resources, especially local tree species are facing extinction.

CHAPTER FIVE

POTENTIAL ENVIRONMENTAL/SOCIAL IMPACT IDENTIFICATION AND EVALUATION

The integration of environmental and social considerations into the operational stage of Kano APPEALS is an essential part to understand the environmental and socio-economic impacts of the interventions and its contribution towards sustainable agricultural development. Environmental and Social Impact Assessment (ESIA) is internationally accepted as being effective way of achieving this integration in a method that is efficient and also meets the requirements of regulators, project financing institutions, civil societies and project affected communities. The assessment of the potential environmental and socio-economic impacts of the proposed project and the description of the identification and evaluation methodology used to assess the significance of impacts, taking into consideration, the impact magnitude and sensitivity of receptors and resources affected are presented in this Chapter.

5.1 Methodology for Impact Identification and Evaluation

The potential environmental and social impacts that are likely to arise as a result of Kano State APPEALS intervention project were assessed by harmonizing the project components with the surrounding environmental, social and cultural resources. This chapter presents the potential impacts resulting from the proposed intervention projects. Combinations of methods were employed in assessing the potential impacts of the proposed intervention across Kano State. These methods include: the use of checklists, public consultations, professional experience and judgment. The phases of impacts assessment include:

i. Impact Identification: to specify the impacts associated with each phase of the project activities;
ii. Impact Prediction: to forecast the nature, magnitude, extent and duration of the impacts; and
iii. Impact Evaluation – to determine the significance of the impacts

5.1.1 Impact Identification

A checklist based on an in-depth understanding of the local environment, existing baseline information and the key project activities was used to develop list of the potential impacts of the project. The following were appraised:

- The source and/or the cause of the problem (project activity/environment aspect);
- The receptor of the impact (environment component i.e. existing ecological and socioeconomic condition of the project environment);
- The way in which the effect is transmitted from the source to the receptor (pathway); and
- The potential consequences (environmental impact).

5.1.2 Impact Prediction

In order to further qualify the impacts of the various project activities on the environment, the identified impacts were characterised based on the nature, duration, and reversibility of the impacts as follows:

- ✓ Beneficial Impacts – these are impacts that have positive and beneficial effects
- ✓ Adverse Impacts – these are impacts that have negative and untoward effects
- ✓ Direct Impacts – these are impacts that are most obvious and are directly related to the proposed project and can be connected to the actions that caused them
- ✓ Indirect Impacts – these are secondary impacts that occur later in time or further away from the impact source
- ✓ Cumulative Impacts – these typically occur from the incremental impact of an action when combined with impacts from projects that have been undertaken recently or would be carried out in the near future
- ✓ Reversible Impacts – these are impacts over which the components involved have the ability to recover after the disturbances caused by the impact
- ✓ Irreversible Impacts – these are impacts whose effects are such that the environmental component cannot be returned to its original state even after adequate mitigation measures are applied
- ✓ Residual Impacts – these are impacts whose effects remain after mitigation measures have been applied
- ✓ Short Term Impacts – these are impacts whose effects remain over a short period of time and are removed after the application of mitigation measures
- ✓ Long Term Impacts- these are impacts whose effects remain over a long period of time, even after the application of mitigation measures.

5.1.3 Impact Evaluation

The third stage in the assessment procedure involved the evaluation of the concerns, issues and impacts identified. At this stage an assessment of the significance of impacts that may result from the proposed intervention was carried out. This also include outlines of the general assessment methods and a presentation of the criteria for determining receptor sensitivity, impact magnitude and impact significance. This is based on the following:

- Duration of the Impact
  - A temporary impact can last days, weeks or months, but must be associated to the notion of reversibility.
  - A permanent impact is often irreversible. It is observed permanently or may last for a very long term.
- Extent of the Impact
  - The extent is regional if an impact on a component is felt over a vast territory or affects a large portion of its population.

- The extent is local if the impact is felt on a limited portion of the zone of study or by a small group of its population.
- The extent is site-specific if the impact is felt in a small and well-defined space or by only some individuals.

- Intensity of the Impact
  - The intensity of an impact is qualified as strong when it is linked to very significant modifications of a component.
  - An impact is considered to be of average intensity when it generates perceptible disturbance in the use of a component or of its characteristics, but not in a way to reduce them completely and irreversible.
  - A weak intensity is associated with an impact generating only weak modifications to the component considered, without putting at risk some of its utilization or its characteristics.
- Impacts Severity

  Once the magnitude of the impact and sensitivity of a receptor have been characterized, the significance can be determined for each impact. The impact significance rating was determined, using the matrix provided in Table 5.1.

Table 5.1: Impact Evaluation Matrix

		Sensitivity/Vulnerability of Receptor		
		Low	Medium	High
Magnitude of Impact	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

- Major Impact: An impact of major significance, hereafter referred to as a 'major impact' is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to a highly valued/sensitive resource/receptors. Repercussions on the environment are very strong and cannot easily be reduced.
- Moderate Impact: An impact of moderate significance hereafter referred to as a 'moderate impact', will be within the accepted limits and standards. Moderate impacts may cover a broad range, from a threshold below which the impact is minor, up to a level that might be just short of breaching an established (legal) limit. Repercussions on the environment are substantial but can be reduced through specific measures.
- Minor Impact: An impact of minor significance, hereafter referred to as a 'minor impact' is one where an effect will be experienced, but whose magnitude is sufficiently small and well within accepted standards, and/or the receptor is of low sensitivity/value. Repercussions on the environment are significant but subdued and may or may not require the application of mitigation measures.

The following environmental indicators, receptors or resources affected by potential impacts were also considered:

Biophysical Environment:

- ✓ Air quality;
- ✓ Noise and vibration;
- ✓ Soils and geology;
- ✓ Water resources;
- ✓ Ecology.

Socio-economic Environment:

- ✓ Visual amenities;
- ✓ Community level impacts;
- ✓ Gender;
- ✓ Community health, safety and security;
- ✓ Labour and working conditions;
- ✓ Infrastructure;
- ✓ Employment and economy; and
- ✓ Cultural Heritage.

5.2 Project Activities of Environmental and Social Concern

The Agro-Processing, Productivity Enhancement and Livelihood Improvement Support (APPEALS) Project as stated earlier is designed to transform the existing large expanse of agricultural land (brown field) into an agricultural production and processing zones. The project activities have been divided into three which include; Agricultural activities, Agro-Processing facilities and Infrastructural development as outlined below:

- Agricultural activities: This entails crop production that would lead to
    - Development and operation of agricultural fields,
    - Construction of small dams, dykes and weirs
        - Site clearing and/or levelling,
        - Compacting and Blasting,
        - Use of heavy equipment and hazardous materials
        - Material Extraction/quarrying, Slope stability/Excavation, cutting and filling
        - Hazardous materials storage and disposal,
        - Waste management,
        - Construction camps
- Agro-Processing activities: These entail crop processing and value addition leading to
    - Dealing with waste,
    - Treatment technologies for wastes from processing
- Development of small and medium scale infrastructures like

- Transmission and distribution of electricity,
- Water supply system,
- Access Roads
    - Site clearing and/or levelling,
    - Compacting & Blasting,
    - Use of heavy equipment and hazardous materials
    - Material Extraction/quarrying, Slope stability/Excavation, cutting and filling
    - Hazardous materials storage and disposal,
    - Waste management,
    - Construction camps

5.3 Evaluation of Potential Impacts of the Proposed Intervention

5.3.1 Potential Positive Environmental and Social Impact

The potential positive impacts of the proposed Intervention by Kano APPEALS are listed below and evaluated in Table 5.2.

- Improvement of communication
- Connecting rural areas to principal road networks
- Access to markets, transportation of goods and services
- Overall positive impact on the economy
- Facilitation of communication between neighbouring rural settlements
- Accessibility to village forests or other areas for land development and use
- Improvement of commercial exchanges
- Access to health and education centres
- Exposure to modern farming techniques
- Human capital development
- Employment generation for local youths
- Increase in agricultural output
- Increase in income of farmer
- Less working time with high productivity
- Enhanced standard of living
- Enhanced Food security in the state and beyond
- Employment generation (supply chain, extension services)
- Enhanced standard of living
- Enhanced Food security
- Employment generation for women and youths.

Table 5.2: Evaluation of Potential Positive Impacts

Specific Project	Potential Positive Impacts	Major Receptors	Evaluation	Significance
1. Network of Farm Access Roads ➢ **Improvement/Infrastructure** ➢ **Operation of farm access road;** ➢ **Operation of lateritic access roads leading to farm lands;** ➢ **Operation of light/small-scale bridges**	➢ Improvement of communication ➢ Connecting rural areas to principal road networks ➢ Access to markets, transportation of goods and services ➢ Overall positive impact on the state and national economy ➢ Facilitation of communication between neighbouring rural settlements ➢ Accessibility to village forests or other areas for land development and use ➢ Improvement of commercial exchanges ➢ Access to health and education centres ➢ Exposure to modern farming techniques ➢ Human capital development ➢ Employment generation for local youths	Contractors, labourers, Farmers, Neighbouring communities, state and national economy	Improved connection to inputs and output markets would enhance the supply of the products on time and would reduce losses, connection to rural resources such as forests, access to health and education facilities, technology transfer and employment generation would have a significant improvement on the livelihoods of the beneficiaries. The magnitude is large and the sensitivity is high.	Major
2. Agricultural production and processing Inputs ➢ **Pesticides** ➢ **New Crop Seeds and seedlings** ➢ **Rice and tomato Processing Machines and** ➢ **Other Inputs**	➢ Increase in agricultural output ➢ Increase in income of farmers ➢ Less working time with high productivity ➢ Enhanced standard of living ➢ Enhanced Food security in the state and beyond ➢ Employment generation (supply chain, extension services)	Farmers, Processors, Community members, people from other communities	Use of improved seeds and other farm inputs such as fertilizer, Improved methods of crop production and utilization of processing equipment would increase the level of output and reduce the level of postharvest losses by farmers. There is assurance of food security and employment generation. There are also capacity building opportunities to the staff of the project. The magnitude is large and the sensitivity is high.	Major
3. Value addition and processing activities	➢ Enhanced standard of living ➢ Enhanced Food security ➢ Employment generation for women and youths	Farmers, Processors, Community members, people from other communities	The proposed project will have a major positive impact on the socio-economic conditions of the local communities in and around the project area as a whole through the creation of permanent and temporary direct jobs as well as indirect jobs through value addition activities. Especially for women and youths, The magnitude is large and the sensitivity is high.	Major

5.3.2 Potential Negative Impacts

The project is likely to generate negative impacts during its implementation. These negative impacts will stem from several activities in the infrastructural development and value chain components of the project. Activities that will generate negative impacts in the infrastructure component include: (i) rehabilitation and construction of rural access road infrastructure; (ii) construction of storage and warehousing facilities; (iii) development and construction of small dams. The value chain component activities that will have negative impacts include: (i) development of warehousing and milling facilities; and, (ii) construction of market facilities. The operational phase of the project is also likely to contribute negative impacts such as pollution arising from the use of fertilizers and other agro-chemicals, loose soils on cleared areas causing raised dust particulate, erosion problem resulting from extensive land cultivation for farming, stagnant water could result to hazard to ecology and communities and act as disease vectors and Soil fertility deterioration. Commercial cultivation of crops such as rice, wheat and tomato may have potential to harm the environment using chemicals, and due to inappropriate land, water and waste management. Crop farming that uses fertilizers and other farm chemicals can have significant impacts which need to be addressed through appropriate mitigation measures.

The potential negative impacts of the project activities in the proposed intervention by Kano State APPEALS with a focus on the three value chains (Rice, Wheat and Tomato) are consistent with category B projects. While the potential negative impacts that could emanate from the project activities are outlined below, evaluation of their potential impacts are presented in Table 5.3.

Negative Impacts

- Destruction of vegetation in and near farm access roads
- Increase in poaching and illegal and excessive removal of firewood and wood for rural construction purposes
- Destruction of wildlife habitat
- Impending wildlife movement
- Reduction in biodiversity
- Destruction of local ecological functionalities and displacement of organisms
- Water pollution and negative effect on surrounding ecosystem
- Loss of certain aesthetic values (visual impacts) from destruction of vegetative cover.
- Acceleration of soil erosion due to poor maintenance and drainage of roads

- Poor maintenance of roads could lead to waste of financial capital and human resources
- Increased migration from nearby cities to areas where the projects are sited
- Spread of communicable and other diseases due to labour influx etc.
- Air pollution
- Flooding
- Vegetation loss
- Impending wildlife movement.
- Reduction in biodiversity
    - Destruction of local ecological functionalities and displacement of organisms.
    - Groundwater pollution and negative effect on surrounding ecosystem
    - Generation of both solid wastes and wastewater.
    - Transmission of HIV/AIDs and other communicable diseases like *tetanus*
    - Harvesting and Postharvest handling of outputs.
    - Fire risks.

Table 5.3: Evaluation of Potential Negative Impacts

Specific Project	Potential Negative Impacts	Major Receptors	Evaluation	Significance
1. Network of Farm Access Roads ➢ **Improvement/Infrastructure** ➢ **Operation of farm access road;** ➢ **Operation of lateritic access roads leading to farm lands;** ➢ **Operation of light/small-scale bridges**	➢ Destruction of vegetation in and near farm access roads ➢ Increase in poaching and illegal and excessive removal of firewood and wood for rural construction purposes ➢ Destruction of wildlife habitat ➢ Impending wildlife movement ➢ Reduction in biodiversity ➢ Destruction of local ecological functionalities and displacement of organisms	Flora, fauna, soil	The project will not lead to excessive loss of flora and fauna around the project sites. Disturbed fauna can migrate to nearby bushes. Impact is limited to project site and of local extent. The magnitude is medium and the sensitivity is low.	Minor
	➢ Water pollution and negative effect on surrounding ecosystem ➢ Loss of certain aesthetic values (visual impacts) from destruction of vegetative cover.	Surface and underground water, Soil, Flora, fauna	Water pollutants a result of oil spills from heavy equipments used during constructions works. The magnitude is medium and the sensitivity is low.	Minor
	➢ Acceleration of soil erosion due to poor maintenance and drainage of roads ➢ Poor maintenance of roads could lead to waste of financial capital and human resources ➢ Increased migration from nearby cities to areas where the projects are sited	Soil, workers, contractors, roads, Community members	Soil erosion results from temporary blockages of drainages during construction. This will b site specific and temporary. The magnitude is medium and low.	Minor
	➢ Spread of communicable and other diseases; and increases in GBV cases due to labour influx	Contractor, Neighbouring communities	Construction activities give several opportunities for external labourers to move enmasse into the sites for semi-skilled labour and hawking of food and other human needs. These would pave way for some vices such as drug abuse, theft, sexual abuse especially involving minors. Transmission of communicable diseases such as	Major

			STIs/HIV/AIDS, Covid-19 could be so easy. The magnitude is medium and high.	
	➢ Occupational health and safety	Contractors, Workers	There are risks associated with working at construction sites such as using heavy machines and equipment, fumes of gases, accidents during transportation, inhale of dusts. The magnitude is medium and the sensitivity is high.	Major
2. Agricultural production and processing activities ➢ **Pesticides** ➢ **New Crop Seeds and seedlings** ➢ **Rice and tomato Processing Machines and Other Inputs** ➢ **Storage**	➢ Air pollution	Air, workers, public	Air pollution likely to occur from land preparation works for subsequent planting and movement of vehicles on untarred surfaces which will result in the increase of airborne particulates and emissions and fumes from machinery and equipment These will affect the air quality in the immediate surroundings. The magnitude is medium and the sensitivity is low.	Minor
	➢ Flooding	Farms, Soil, water, neighbouring communities	Flooding occurs upon full saturation of the soil with water: and spill of water from reservoirs like dams, washing away crops, aggravating erosion, mostly during the rainy season. The magnitude is medium and the sensitivity is high	Major
	➢ Groundwater pollution and negative effect on surrounding ecosystem	Groundwater, public	Disposal of biological and chemical construction waste materials would adversely affect the quality of the groundwater. The impact is direct, temporary and likely, lasting during the construction phase; the impact is also local in extent i.e. limited to the project site and nearby underground water sources. . The magnitude is small and the sensitivity is high.	Major
	➢ Pests and diseases	Crops, Farmers	Pests and diseases attack and destroy crops, Pests such as insects, birds, rodents and diseases cause a lot of damages to the crops in the fields and during storage. The magnitude is large and the sensitivity is high.	Major
3. Value addition and processing activities	➢ Generation of solid wastes.	Soil, Water, Public	Wastes are generated especially through servicing and maintenance of agroprocessing machinery. Wastes are generated in rice, wheat and tomato processing and marketing sites,	Major

			which requires evacuation and disposal. Wastes from processing machineries include scrap metal, empty lubricant containers, waste lubricants, rubber seals. Domestic/ wastes such as used polythene bags, food wastes, food wrappers, used water sachets and bottles, office wastes and human wastes will be generated. The impact is local and will last throughout the agricultural development and operation phase. The magnitude is medium and the sensitivity is high.	
	➢ GBV cases and transmission of communicable diseases such as HIV/AIDS, Covid-19 etc through labour influx.	Workers, Community members,	The spate of gender based violence cases, especially with minors: and spread of sexually transmitted diseases, such as HIV/AIDS: and communicable diseases such as Covid-19 due to labour influx have an adverse impacts on the livelihood and standard of living of the workers and general public. The magnitude is medium and the sensitivity is high.	Major
	➢ Noise and Vibration	Workers, Public	Activities that will contribute to increased noise levels during the construction phase include; vehicular and truck movement, site clearing and preparation. In the farms, use of machines for planting and post-planting operations may increase noise and vibration levels. During processing, rice, wheat and tomato use of machines would also add to noise and vibration levels. The impact is direct, temporary and likely, moderate in scale; the impact is also local in extent. The magnitude is medium and the sensitivity is high.	Major
	➢ Fire risks	Processors, Property, Public	Stores at aggregation centres and processing plants could be exposed to dangers of fire. This could be as a result of electric faults and indiscriminate use f open fires. These could lead to burns and subsequent deaths; and destruction to property. The magnitude is medium and the sensitivity is moderate.	Major

CHAPTER SIX

MITIGATION MEASURES

Mitigation measures for the potential adverse impacts are proposed in Table 6.1 to ensure that the project impacts are managed within reasonable and acceptable limits. The general rules followed in designing the mitigation measures are listed below:

(a) avoidance of major impacts: major impacts are impacts where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resources/receptors;
(b) reduction of major and moderate impacts: moderate impacts are impacts within accepted limits and standards. Moderate impacts may cover a broad range, from a threshold below which the impact is minor, up to a level that might be just short of breaching an established (legal) limit; and
(c) minor impacts occur where effects are experienced, but the impact magnitudes are sufficiently small and well within accepted standards, and/or the receptors are of low sensitivity/value.

6.1 Types of Mitigation Measures

The mitigation measures adopted may be categorized as:

- Preventive measures;
- Control measures; and
- Compensatory measures.

6.1.1 Preventive Measures

These are measures adopted during the design and pre-construction phase. The measures are aimed at avoiding or minimizing potential major impacts at source. Avoiding or reducing an impact at source is essentially ‘designing’ the project so that a feature causing an impact is designed out (e.g. site selection to avoid sensitive areas) or altered (e.g. working at night where necessary) or avoided (e.g. community sensitization programmes to avoid conflicts or confrontations).

6.1.2 Control Measures

These are measures adopted to abate or remedy the impacts occurring during construction and operation/maintenance phases. Impacts can be abated on site or at receptor end. Repair or remedy of impacts involves unavoidable damage to a resource, e.g. vegetation clearing during land preparation. In this case repair essentially involves the re-vegetation of the affected parts.

6.1.3 Compensatory Measures

Where other mitigation measures are not possible or fully effective, compensation, when required, will be provided in accordance with the national standards as set down by the relevant entities.

6.2 Summary of Significant Potential Adverse Impacts

The potential negative impacts of the project activities in the proposed intervention by Kano State APPEALS with a focus on the three value chains (Rice, Wheat and Tomato) are consistent with category B projects. While the potential negative impacts that could emanate from the project activities are outlined below:.

Potential Negative Impacts

- Destruction of vegetation in and near farm access roads
- Increase in poaching and illegal and excessive removal of firewood and wood for rural construction purposes
- Destruction of wildlife habitat
- Impending wildlife movement
- Reduction in biodiversity
- Destruction of local ecological functionalities and displacement of organisms
- Water pollution and negative effect on surrounding ecosystem
- Loss of certain aesthetic values (visual impacts) from destruction of vegetative cover.
- Acceleration of soil erosion due to poor maintenance and drainage of roads
- Poor maintenance of roads could lead to waste of financial capital and human resources
- Increased migration from nearby cities to areas where the projects are sited
- Spread of communicable and other diseases due to labour influx etc.
- Air pollution
- Flooding
    - Vegetation loss
    - Impending wildlife movement.
    - Reduction in biodiversity
    - Destruction of local ecological functionalities and displacement of organisms.
    - Groundwater pollution and negative effect on surrounding ecosystem
    - Generation of both solid wastes and wastewater.
    - Transmission of HIV/AIDs and other communicable diseases like *tetanus*
    - Harvesting and Postharvest handling of outputs.
    - Fire risks.

Mitigation measures aim to remedy or compensate for the predicted adverse impacts of the project (proposed or existing) on site. The necessity of mitigation has been integrated into the study as a critical part of the methodology. This was stated in the ESIA methodological framework as an element of the scoping stage. The approach adopted is centered on consideration of all identified environmental and social variables that are connected to the development project and prepare sui mitigation measures. It should be stated that the measures stated in this chapter are based on the need to streamline the adverse impacts of the project in the study area as positive impacts require no mitigation. Thus, each of the environmental and social impact was scrutinized and respective mitigation measures provided. In general, there are two fundamental intervention projects which were designed for the development of rural infrastructure particularly for the enhancement of agricultural productivity. These are networks of farm access roads and rural energy provision. For the study area, these have been provided in conjunction with others such as provision of seeds and seedlings and intervention/ support schemes. The stated mitigation measures are therefore developed as project specific.

To ensure that the impacts emanating from the APPEALS intervention project activities are mitigated, time-tested standard designs, employing new technology with bias for environmental and social safety will be adopted. The measures that will mitigate the impacts identified with the respective intervention projects and associated activities are stated in the following sections and subsections.

6.2.1 Operations and Maintenance of Farm Access Roads and small Dams

Several activities will characterize the landscape during the operation of this intervention project. Generally, roads are essential connecting and mobility modes from place to place which are related to interaction and socioeconomic development. Therefore, any issue connecting the road development tends to cut across several aspects of the environment. Issues such as air quality and noise, water quality, soil quality, ecology, wildlife and forestry, socioeconomics and health are amongst several other areas that will be impacted during the operation stage of this intervention project.

6.2.2 Air quality and noise

Health and safety issues emanating from dusts and other gaseous emissions inhalation by either road users or the community inhabitants are another instances of air quality issues that are connected to operation and maintenance of farm access roads in the study area. This is based on the introduction of gaseous emissions from vehicles plying the roads thereby reducing the pristine status of air and the eventual introduction of new local scale air quality issues. In addition, during operation, noise level for vehicles plying the road might likely increase owing to movement of vehicles across the road and likely generation of traffic. The parameters to determine the air quality include Sulphur dioxide (SO_2), Nitrogen dioxide (NO_2), Carbon monoxide (CO), Particulate matter (PM_{10}), Ammonia (NH_3), temperature, humidity and sound. Air quality status in the State has been a course of concern for a long

period of time, especially in the urban centres, where markets and agro-processing activities are on the increase. This is evident as there were studies conducted on the assessment of gaseous pollutants along high traffic roads in Kano by Okunola *et al*., (2012); and Garba and Yunusa (2016). The studies assessed pollutants such as CO, H_2S, NO_2, SO_2, NH_3, CH_4 and FL (Flammable gases). The results indicated presence of these gases in the ambient air at levels higher than the standard limits of the regulatory bodies and therefore possible to cause health problems.. The permissible limits of these materials are presented in Table 6.1, as given by the FGN National Environmental (Air Quality Control) Regulations, 2014.

Table 6.1: Ambient Air Quality Standards

S/N	Pollutant	Time weighted average	Concentration in ambient air
1.	Sulphur dioxide (SO_2)	1 hour	350µg/m^3
2.	Nitrogen dioxide (NO_2)	1 hour	200µg/m^3
3.	Carbon monoxide (CO)	1 hour	10.0mg/m^3
4.	Particulate matter (PM10)	24 hours	150µg/m^3
5.	Ozone (O_3)	1 hour	180µg/m^3
6.	Lead (Pb)	24 hours	1.40µg/m^3
7.	Arsenic (As)	Annual	6,000µg/m^3
8.	Nickel (Ni)	Annual	20,000µg/m^3
9.	Cadmium (Cd)	Annual	5,000µg/m^3
10.	Ammonia (NH_3)	24 hours	0.60mg/m^3

SOURCE: FGN National Environmental (Air Quality Control) Regulations, 2014.

Mitigation actions to be taken to curb the impact of air quality and noise include:

- Speed breaks should be introduced at specific junctions
- Sprinkle water during construction.
- Trees should be planted within few metres distance between road and residential areas.
- Road signs indicating the speed limit should be erected at sections of the road.
- Ensure all construction equipment, machinery and vehicles are clean

6.2.3 Water quality

Small quantities of sediments and dripping oil and grease from the road surface may be washed out and discharged to nearby surface water bodies as runoff during the rainy season. Such chemical compounds could also seep further down the surface layers to pollute groundwater. This impact during the rainy season might be relatively small as there is available runoff flowing at the peak levels. Also, effluents generated from in-washing or mixture of water with chemical lubricants might contain COD and SS which will impact adversely on the water quality of the area as the effluents will be discharged into the surrounding wetlands and other connecting water bodies. The parameters of water quality

assessment include turbidity, colour, temperature, pH, total alkalinity, total hardness, Calcium, Magnesium, Iron, Chloride, Nitrate, Flouride, total dissolved solid and electric conductivity. Studies on assessment of groundwater quality in Kano as reviewed by Shawai *et al.,* (2019), indicated that studies conducted to ascertain groundwater quality in some selected sites of Bichi, Dala, Fagge, Kumbotso and Nassarawa revealed that the water had satisfied the safety limits for various purposes including domestic, agricultural and industrial. In another study by Suleiman, Ibrahim and Abdullahi (2020), groundwater of many areas in Gwale Local Government, Kano State was found to be unsafe for drinking, due to anthropogenic activities, such as improper waste disposal. The study recommended periodic monitoring of groundwater quality parameters by the government. The permissible limits of these materials are presented in Table 6.2, as given by the FGN National Environmental (Groundwater Quality Control) Regulations, 2014.

Table 6.2: Groundwater Quality Standards

S/N	Substances	Highest Desirable Level	Maximum Permissible Level
1	Total Solids	500mg/L	1,500mg/L
2	pH Range	7.0-8.5	6.5-9.2
3	Mineral Oil	0.01mg/L	0.30mg/L
4	Phenolic Compounds	0.02mg/L	0.002mg/L
5	Bromide	0.01mg/L	0.10mg/L
6	Chloride as Cl^-	200mg/L	600mg/L
7	Chlorine	<200mg/L	5.00mg/L
8	Nitrate	45.0mg/L	50.0mg/L
9	Nitrite	0.50mg/L	2.00mg/L
10	Fluoride	0.6-1.5mg/L	1.50mg/L
11	Copper as Cu^{++}	0.05mg/L	1.50mg/L
12	Iron as Fe^{++}	0.10mg/L	1.00mg/L
13	Zinc as Zn^{++}	0.50mg/L	15.0mg/L
14	Sulphate as SO_4	200mg/L	400mg/L
15	Total Hardness ($CaCO_3$)	100mg/L	500mg/L
16	Calcium as Ca^{++}	75.0mg/L	200mg/L
17	Magnesium as Mg^{++}	30.0mg/L	150mg/L
18	Manganese as Mn^{++}	0.05mg/L	0.50mg/L
19	Anionic Detergents	0.20mg/L	1.00mg/L
20	Colour	5 Units	50 Units
21	Odour	Unobjectionable	Unobjectionable
22	Taste	Unobjectionable	Unobjectionable

SOURCE: FGN National Environmental (Surface and Groundwater Quality Control) Regulations, 2011.

Mitigation measures to be taken concerning water quality will include:

- Chemical wastes from vehicles should be handled carefully and dumped properly.
- Domestic refuse should be dumped in the spaces provided by government.
- Industrial wastewater and effluents must be treated in-situ before disposal.
- Motorists should be educated on the dangers of indiscriminate dumping of chemical wastes close to farmlands and water bodies.
- Motorists and road users should use approved mechanic villages for repair of faulty vehicles and not roadsides.
- Ensure all construction equipment, machinery and vehicles are clean
- Ensure regular checks and maintenance of vehicles and machinery to avoid oil spills

6.2.4 Ecology and biodiversity

Contamination of surface water and groundwater which will arise from chemical effluents, solid waste disposal and discarded lubricants or any other solid waste along the roadway could impair the ecology of the project area. Apart from impairment of water quality and stimulating water pollution, aquatic ecological lives are not spared of the risks posed by these chemicals.

Mitigation measures shall include:

- Trees should be planted in the open farm access roads.
- Official waste dump sites should be established and waste management operators should be contacted on the prompt clearing of wastes deposited.
- The landscape should be permitted to re-grow based on application of some control mechanism to prevent wildlife intrusion into residential and administrative quarters.
- Residents should be advised to use appropriate waste dump sites and to stop indiscriminate waste dumping.

6.2.5 Wildlife and forestry

Fauna tends to react to changes in surrounding land uses. Macrofauna constituents of an area are sensitive to noise from vehicles. As such they migrate from their previous habitats to a new one which provides almost similar environmental condition to their former abode.

Therefore, as trees are being decimated the associated wildlife tends to migrate. Similarly, micro-fauna resources could be impaired due to the level of road construction embarked upon.

Mitigation actions on wildlife and forestry will include.

- Road signs indicating the design speed which should be consistent with environmental safety should be erected along the access roads.
- Trees should be planted in open lands, those removed for any purpose should be replaced.
- Proper cleaning and clearing of petroleum products used after repairs of faulty vehicles along the farm access roads
- Speed breaks should be introduced at specific points to curb noise related to over-speeding motorists.
- The community should be engaged on the need to keep to all environmental and safety regulations.

6.2.6 Socioeconomic and community health

Socioeconomic life of the community is at the centre of any development–oriented project. The farm access roads have both positive and negative impacts. As it is already stated, positive impacts require no mitigation, the mitigation provided in this section will involve such issues that have had adverse effect on the socioeconomic life and community health. Increased traffic tends to have higher risks to health and safety on the people of the area. There is also the case of discomforting operational noise to the immediate communities. This scenario is usually connected to local road users, pedestrians and cyclists. Accidents are also envisaged to occur, especially involving school children, aged, women and people living with disabilities. Public/environmental nuisance issues associated with dust and exhaust fumes can arise and may have a significant effect on neighboring settlements and locations. Transmission of HIV/AIDs, Covid-19 and other communicable diseases due to free-flow and high influx of people (especially, labourers) particularly during the construction and operation phases.

Mitigation actions to be taken should include the following.

- Road signs and symbols indicating design speed should be erected along the road corridor to guide all motorists.

- Introduction of speed breakers at specific junctions particularly places that could develop to accident black spots or places where children and people living with disabilities do cross the road.

- Proper cleaning and clearing of petroleum products.

- Enhancing education and sensitization of workers and the local communities on the dangers and prevalence of communicable diseases like STIs/HIV/AIDS.

- The community should be engaged on the importance of observing the movement of vehicles before crossing the road.

6.2.7 Value Addition and Processing Activities

Value addition activities of agricultural produce will result in generation of both solid wastes and wastewater which may have negative impacts unless effectively managed. The negative impacts can be mitigated with the following measures. Transmission of STIs/HIV/AIDS, Covid-19 and other communicable diseases due to labour influx of people particularly during the construction and operation phases.

- Put in place appropriate waste management mechanisms for both solid and wastewater.

- Educate and sensitize the population on being mindful of and responsible for their own environment.

- Enhancing education and sensitization of workers and the local communities on the dangers and prevalence of diseases such as STIs/HIV/AIDS and Covid-19.

- Regular sensitization campaigns and monitoring of the spread of diseases.

- Development of brochures and other materials that will convey information about diseases and infections.

- Allow community participation in facility provision, construction and maintenance

6.3 Mitigation Measures for Significant Potential Adverse Impacts

Tables 6.3, 6.4, 6.5, 6.6, 6.7, 6.8 and 6,9 provide a summary of the significant environmental and social impacts, based on the evaluation, the impact receptors and the recommended mitigation measure for each impact of construction and maintenance of farm access roads and small dams, rice, wheat and tomato value chains respectively. The application of the mitigation measures in general is expected to reduce major and moderate impacts to minor or negligible impacts that may not require further mitigation.

Table 6.3: Mitigation Measures for Significant Potential Adverse Impacts of construction and maintenance of farm access roads and small dams

	Activities	Environmental and social impact	Key Receptors	Mitigation measures	Monitoring	Responsibility
1.	The potential air quality and noise impact will include					
		➢ Increase in noise and dust due to vehicles movement and construction activities ➢ Gaseous emissions from vehicles plying the roads. ➢ Health and safety issues of both the workers, residents and the road users due to vehicular speed and introduction of harmful gases	Flora, fauna, soil	➢ Speed breaks should be introduced at specific points. ➢ Trees should be planted within few metres distance between road and residential areas to reduce noise. ➢ Sprinkle water during construction. ➢ Road signs indicating the speed limit should be erected at sections of the road. ➢ The use of rickety vehicles should not be allowed	➢ Regular check for adherence to safety concerns. ➢ Ensure that all areas have trees planted along the road corridors. ➢ Ensure that road signs are placed along the road corridors. ➢ Ensure that speed limits are strictly adhered to. ➢ Ensure that vehicles are in good condition so as not to pollute the environment when driving along the roads.	Contractor, ESS, RIE, CBDO, COO, CIGs
2.	Water quality impact will include					
		➢ Oil and grease droplets might pollute surface and groundwater. ➢ Effluent generated from mixture of water with chemical lubricants might contain COD and SS which will impact adversely on the water quality of the area.	Soil, water, workers, motorists, Public	➢ Chemical wastes from vehicles should be handled carefully and dumped properly; ➢ Motorists should be educated on the dangers of indiscriminate dumping of chemical	➢ Ensure that proper waste management practices are adhered to. ➢ Adherence to the principles of safe and clean environment should	Motorist, Contractor, ESS, RIE, CBDO, COO, CIGs

		➢ Solid wastes generated and dumped around the area may sip and contaminate the groundwater.		wastes close to farmlands ➢ Motorists and road users should use approved mechanic villages for vehicular repairs. ➢ Ensure all construction equipment, machinery and vehicles are clean ➢ Ensure regular checks and maintenance of vehicles and machinery to avoid oil spills. ➢ Ensure proper waste disposal strategies.	be taken paramount. ➢ Road users should be made to observe the mitigation measures.	
3.	Ecology and biodiversity impact will include.					
		➢ Contamination of surface water and groundwater from chemical effluents. ➢ Poor and untidy environment. ➢ Risks and impairment of the ecosystem.	Surface water, groundwater, Community members	➢ Where possible, the clearing of vegetation, particularly of indigenous trees needs to be avoided as much as possible during construction, and the clearing needs to be carried out only where necessary ➢ Trees should be planted in the open farm access roads.	➢ Regular environmental assessment with interest on the ecological biodiversity. ➢ Consistent checks on the management of waste.	Contractor, ESS, RIE, CBDO, COO, CIGs

				➢ Official waste dump sites should be established and waste management operators should be contacted on the prompt clearing of waste deposited. ➢ Where clearing is done, land should be landscaped and reclaimed by planting more trees and other forms of vegetation. ➢ Community members should be advised to use appropriate waste dump sites and to stop indiscriminate waste dumping.		
4.	Wildlife and forestry impact will include					
		➢ Migration to a new habitat where it is possible to adapt. ➢ Loss of original forest cover. ➢ Evolvement of invasive plant life. ➢ Reduction in the population of micro fauna	Flora, Fauna	➢ Massive tree planting around the area. ➢ Regular checks on the invasive plants. ➢ The community should be engaged on the need to keep to all environmental and safety regulations.	➢ Consistent checks on the adherence to safety regulations. ➢ Regular cleaning and clearing of the environment. ➢ Ensure massive tree planting.	Contractor, ESS, COO, CBDO, CIGs
5.	Socioeconomic and community health impact will include					
		➢ Exposure to danger in form of road accidents. ➢ Adverse adjustment to vehicular	Workers, Farmers, neighbouring community	➢ Road signs and symbols indicating designated speed should be erected. ➢ Introduction of speed	➢ Consistent checks on the adherence to safety regulations.	Contractor, ESS, RIE, COO, CBDO,

		traffic and noise. ➢ Health implication to children from petroleum effluents. ➢ Transmission of STIs/HIV/AIDS and other communicable diseases, like Covid-19 due to free-flow and high influx of labour; *tetanus* due to cuts with metal objects particularly during the construction and operation phases. ➢ Gender Based Violence cases due to labour influx		breakers ➢ Proper cleaning and clearing of petroleum products. ➢ Sensitize workers and community members on the ways of contracting HIV/AIDS through collaboration with NGOs, CBOs available in the State. ➢ Empower the testing centres for STIs/HIV/AIDS within the health facilities in the immediate communities. ➢ Ensure that Covid-19 protocols as provided by the Presidential Tasks Force and other health agencies in the construction sites and camps. ➢ Traditional leaders in the communities should be engaged to sensitize the workers on the values and norms of the people in the area. ➢ Contractor should provide labour influx management plan to APPEALS for approval. ➢ The community should be engaged on the need to keep to all environmental and safety regulations.	➢ Regular check on the adherence to traffic regulations by road users.	CIGs

Table 6.4: Mitigation Measures for Significant Potential Adverse Impacts for Rice Production

S/n	Activities	Environmental and social impact	Key Receptors	Mitigation measures	Monitoring	Responsibility
1.	Pre-cropping activities	• Poor site selection (poor soil and water quality). • Interference on biodiversity conservation (changes in flora and fauna) • Deterioration from burning of biomass of cleared forest and addition of carbon into the atmosphere • Increased runoff from land clearing and maximum tillage leading to soil quality and nutrient loss. • Loss of valuable natural plant species that are of medicinal value to the neighboring communities. • Removal of the topsoil from cuttings of trees and shrubs • Oil leakages from vehicles impacting surface water negatively. • Risk of work-site accidents from the improper handling of machines and equipment.	Farmers, Community members	• Selection of a good site for cropping activities • Avoid environmentally sensitive sites and unnecessary exposure to sensitive habitat • Consult Forestry Department in the selection and use of such sites • Avoid burning of biomass as much as possible and the use of fire only in situations where this is least environmentally damaging. • Adopt Minimum tillage practices • Create natural plant protection zone. • Ensure that the trees and shrubs are cut down only where necessary • Regular maintenance of vehicles.	Soil and water quality tests to be compared with post cropping levels. Also, ensure trees are planted around the farms.	Farmer, ESS, PES, RIE, CBDO, Facilitator Rice, CIGs

		• Noise and vibration. • Dust and gas emissions from the discharge of particulates that may increase respiratory diseases around the sub-project vicinity		• Use PPE and machine manuals. • Use of noise protection devices. • Use goggles and face masks during activities		
2.	Production level	• Surface and ground water contamination through the excessive application of fertilizer. • Extreme weather conditions such as heavy rains. • Pests emergence	Surface water, groundwater, Soil, Crop	• Minimum use of fertilizer and introduction of organic fertilizers. • Adherence to Cropping calendar to suit weather. • Adhere to Integrated pest management plan.	Water quality tests, Establish cropping calendar, Provision of integrated Pest Management Plan	Farmer, ESS, PES, RIE, CBDO, Facilitator Rice, CIGs
3.	Farm operation and management	• Disposal of Agro-chemical containers • Human health deterioration through the pollution of water sources from production wastes and residues	Farmers, Public, Surface water, groundwater, Soil	• Proper disposal of Agro-chemical containers • Training on agro-chemical containers handling • Pipe-borne water should be provided in the long term to all the farmers	Trainings on disposal of agrochemical containers. Provision of Pipe-borne water	Farmer, ESS, PES, RIE, CBDO, Facilitator Rice, CIGs
4.	Harvesting and post-harvest handling	• Accidents when using machines and injuries caused by reptiles • Losses due to pest attack in the stores • Contamination of produce with foreign materials during	Farmers, Workers, Paddy	• Use PPE during harvest and postharvest activities. • Good practices on harvest and post-harvest handling. • Use of simple machines for harvesting and post-harvest handling. • Integrated Pest Management	Training and adoption of good practices of harvest and post-harvest handling.	Farmer, ESS, PES, RIE, CBDO, APS, COO, Facilitator Rice, CIGs

		post-harvest operations (Open drying of paddy).		protocols should be adhered to during storage of paddy and processed rice. • Drying should be in protected, enclosed and hygienic stalls. • Mechanical dryers should be used.	Innovating simple and cost effective machines like threshers for harvesting and post-harvest handling. Encourage the fabrication of simple and affordable mechanical dryers.	
5.	Marketing	• Accidents and injuries during loading and off-loading. • Food wastes and losses during transportation. • Food wastes and losses during storage.	Marketers, Workers, transporters, Public	• Use of supporting equipment for loading and off-loading. • Ensure proper packaging during transportation. • Ensure provision of adequate storage facilities.	• Ensure that farmers and transporters Use standard packaging materials, means of transportation and storage facilities.	Farmer/ Marketer, ESS, PES, RIE, CBDO, APS, Facilitator Rice, CIGs

Table 6.5: Mitigation Measures for Significant Potential Adverse Impacts for Rice Processing

S/N	Activities	Environmental and social impact	Key Receptors	Mitigation measures	Monitoring	Responsibility
	Rice Milling	• Procurement of poor-quality machines and equipment • Increase in amounts of dust and exhaust fumes from vehicle movement on the site • Generation of solid wastes such as husks. • Burning of rice husks in the milling plants • Risk of injury and accidents from operating processing machines. • Product contamination due to improper sanitation and hygiene in plant	Millers, Marketers, Public	• Ensure all procurement, construction and installation activities follow approved standard. • Use a good de-stoner machine. • Sprinkling of water to minimize dusts. • Adhere to waste management plan protocols. • Promote the use of husks for livestock feeds and other uses such as source of energy. • Use of Personal Protective Equipment including goggles and face masks during activities • Use of noise protection devices. • Use standard sanitation and	• Check the environment for the status of the wastes • Monitor the use of Personal protective equipment in plant • Ensure compliance to standard protocols in the plant. • Enhance innovation of local milling equipment. • Train millers on the use of milling equipment.	Processor, ESS, APS, CBDO, RIE, WYEL, Facilitator Rice, CIGs

				hygiene protocols		
	Parboiling	• Generation of solid waste and wastewater. • Excessive use of firewood as source of energy. • Use of chemical detergents in parboiling. • Drying in open spaces, where people and animals trample. • Product contamination due to improper sanitation and hygiene during drying of parboiled rice.	Parboilers, Marketers, Public	• Proper waste management • Use of alternative energy sources in parboiling, such as liquefied natural gas and husks. • Sensitize processors on the adverse effects of use of detergents and other harmful chemicals during parboiling. • Use of standard drying facilities in enclosed sites. • Plant trees around the processing plant.	• Ensure the implementation of waste management plan • Ensure the use of proper drying facilities. • Ensure planting of trees.	Processor, ESS, APS, CBDO, RIE, WYEL, Facilitator Rice, CIGs

Table 6.6: Mitigation Measures for Significant Potential Adverse Impacts for Wheat Production

S/N	Activities	Environmental and social impact	Key Receptors	Mitigation measures	Monitoring	Responsibility
1.	Pre-cropping activities	• Poor site selection (poor soil and water quality). • Interference on biodiversity conservation (changes in flora and fauna) • Deterioration from burning of biomass of cleared forest and addition of carbon into the atmosphere • Increased runoff from land clearing and maximum tillage leading to soil quality and nutrient loss. • Loss of valuable natural plant species that are of medicinal value to the neighbouring communities. • Removal of the topsoil from cuttings of trees and shrubs • Oil leakages from vehicles impacting on surface water negatively. • Risk of work-site accidents from the improper handling of machines and equipment. • Dust and gas emissions from the discharge of particulates that may increase respiratory diseases around	Farmers, Community members, Air, Soil, flora, fauna	• Selection of a good site for cropping activities • Avoid environmentally sensitive sites and unnecessary exposure to sensitive habitat • Consult Forestry Department in the selection and use of such sites. • Avoid burning of biomass as much as possible and the use of fire only in situations where this is least environmental damaging. • Adopt Minimum tillage • Create natural plant protection zone. • Ensure that the trees and shrub are cut down only where necessary. • Plant trees around the area. • Regular maintenance of vehicles. • Use of PPE and machine manuals.	Soil and water quality tests to be compared with post cropping levels. Also ensure that trees are planted around the farms.	Farmer, ESS, PES, RIE, CBDO, Facilitator Wheat, CIGs

		the sub-project vicinity		• Use of noise protection equipment. • Ensure tree planting.		
2.	Production level	• Surface water contamination through the excessive application of fertilizer. • Extreme weather conditions such as heavy rains. • Pest emergence.	Surface water, underground water, Crop	• Minimum use of fertilizer and introduction of organic fertilizers. • Adherence to Cropping calendar to suit weather. • Use integrated pest management plan.	Water quality tests Establish cropping calendar. Prepare an IPM plan	Farmer, ESS, PES, RIE, WYEL, CBDO, Facilitator Wheat, CIGs
3.	Farm operation and management	• Disposal of Agro-chemical containers. • Human health through the pollution of water sources from production wastes and residues	Soil, Surface water, Farmer, Community members	• Proper disposal of Agro-chemical containers. • Training on agro-chemical containers handling. • Pipe-borne water should be provided in the long term to all the farmers.	• Trainings on disposal of agrochemical containers. • Provision of Pipe-borne water	Farmer, ESS, PES, RIE, WYEL, CBDO, Facilitator Wheat, CIGs
4.	Harvest and post-harvest handling	• Accidents and injuries. • Food losses • Contamination of produce with foreign materials during post-harvest operations.	Farmer, Workers	• Good practices on harvest and post-harvest handling. • Use of simple machines for	• Training and adoption of good practices of harvest and post-harvest	Farmer, ESS, PES, RIE, WYEL, CBDO,

		.		harvesting and post-harvest handling.	handling. • Innovating simple and cost effective machines for harvesting and post-harvest handling.	APS, Facilitator Wheat, CIGs
5.	Marketing	• Accidents and injuries during loading and off-loading. • Food wastes and losses during transportation. • Food wastes and losses during storage.	Farmer, Transporter, Marketer, Workers	• Use of supporting equipment for loading and off-loading. • Ensure proper packaging during transportation. • Ensure adequate storage facilities are provided and used to reduce wastes.	• Ensure that farmers and transporters use standard packaging materials and means of transportation • Ensure the use of standard procedure for processing paddy.	Farmer/ Marketer, ESS, RIE, WYEL, CBDO, APS, Facilitator Wheat, CIGs

Table 6.7: Mitigation Measures for Significant Potential Adverse Impacts for Wheat Processing

S/N	Activities	Environmental and social impact	Key Receptors	Mitigation measures	Monitoring	Responsibility
1.	Wheat Milling	• Procurement of poor-quality machines and equipment. • Increase in amounts of dust and exhaust fumes from vehicle movement and milling machines. • Noise and vibration. • Generation of solid wastes. • Risk of injury and accidents from operating processing machines. • Product contamination due to improper sanitation and hygiene in plant	Millers, Marketers, Public	• Ensure all procurement, construction and installation activities followed approved standard. • Sprinkling of water to minimize dusts. • Ensure proper handling and disposal f solid waste generated. • Use of Personal Protective Equipment including goggles and face masks during activities • Use of noise protection devices. • Use standard sanitation and hygiene protocols	• Check the environment for the status of the wastes. • Ensure the provision of wastes disposal sites for the millers. • Monitor the use of Personal protective equipment in plant • Ensure compliance to standard protocols in the plant. • Enhance innovation of local milling equipment. • Train millers on the use of milling equipment.	Processor, ESS, APS, CBDO, RIE, WYEL, Facilitator Wheat, CIGs
2.	Gurasa Production	• Generation of solid wastes and wastewater. • Product contamination due to improper sanitation and hygiene in processing plant.	Gurasa makers, Neighbouring communities, Gurasa marketers	• Proper waste management • Use of standard protocols for sanitation and hygiene in plants • Ensure the use of standard food processing protocols	Ensure compliance with waste management Plan.	Processor, ESS, APS, RIE , CBDO, WYEL, COO,

		• Improper inclusion of food additives and related chemicals in the finished product. • Increased use of firewood for energy. • Inadequate technology use in making *gurasa*. • Direct contact to heat source causing dehydration and physical burns. • Risk of fire incidence		approved by NAFDAC • Promote the use of alternative energy like Liquefied Natural Gas. • Plant trees around the processing areas. • Provide a modern oven for *gurasa* making. • Consistent use of PPE. • Frequent medical check-ups at least one in six months. • Provide fire extinguishers in the plants.	Ensure adherence to standard food processing protocols in plant. Ensure sensitization on the use of alternative energy source and tree planting. Encourage fabrication of *gurasa* making oven. Ensure that gurasa makers undergo medical check-ups within the stipulated time. Training on the use of fire extinguishers.	Facilitator Wheat, CIGs

Table 6.8: Mitigation Measures for Significant Potential Adverse Impacts for Tomato Production

S/N	Activities	Environmental and social impact	Key Receptors	Mitigation measures	Monitoring	Responsibility
1.	Pre-cropping activities	• Poor site selection (poor soil and water quality). • Interference on biodiversity conservation (changes in flora and fauna) • Cultivation of single crop may alteration of natural vegetation due to cultivation of single crop • Deterioration from burning of biomass of cleared forest and addition of carbon into the atmosphere • Increased runoff from land clearing and maximum tillage leading to soil quality and nutrient loss. • Loss of valuable natural plant species that are of medicinal value to the neighboring communities. • Removal of the topsoil from cuttings of trees and shrubs • Oil leakages from vehicles impacting surface water negatively. • Risk of work-site accidents from the improper handling of machines and equipment. • Dust and gas emissions from the discharge of particulates that may increase respiratory disease around the sub-project vicinity	Farmers, Community members, Air, Soil, flora, fauna	• Selection of a good site for cropping activities • Avoid environmentally sensitive sites and unnecessary exposure to sensitive habitat • Consult Forestry Department in the selection and use of such sites • Avoid burning of biomass as much as and the use of fire only in situations where this is least environmental damaging. • Adopt Minimum tillage • Create natural plant protection zone. • Ensure that the trees and shrub are cut down only where necessary • Regular maintenance of vehicles. • Use of PPE and machine manuals. • Use of noise protection. • Ensure trees are planted in the area.	Soil and water quality tests to be compared with post cropping levels. Ensure also that tress are planted in the areas.	Farmer, ESS, PES, RIE, WYEL, CBDO, COO, Facilitator Tomato, CIGs
2.	Production level	• Surface water contamination through the excessive application of fertilizer. • Extreme weather conditions such	Surface water, underground water, Crop	• Minimum use of fertilizer and introduction of organic fertilizers. • Establish cropping calendar	• Water quality tests • Adherence to Cropping	Farmer, ESS, PES, RIE, WYEL, CBDO, COO,

		as heavy rains. • Pests emergence		• Integrated pest management plan.	calendar to suit weather.	Facilitator Tomato, CIGs
3.	Farm operation and management	• Disposal of Agro-chemicals container • Human health through the pollution of water sources from production wastes and residues	Soil, Surface water, Farmer, Community members	• Proper disposal of Agro-chemical containers. • Training on agro-chemical containers handling. • Pipe-borne water should be provided in the long term to all the farmers	• Trainings on disposal of agrochemical containers. • Check for the availability of Pipe-borne water	Farmer, ESS, PES, RIE, WYEL, CBDO, COO, Facilitator Tomato, CIGs
4.	Harvest and post-harvest handling	• Accidents and injuries. • On-farm losses of tomato fruits.		• Good safety operation practices during harvest and post-harvest handlings. • Use simple tomato harvesting and collection implement.	• Ensure adherence to safety protocols. • Ensure innovation of simple tomato harvesting and collection implements.	Farmer, ESS, APS, RIE, WYEL, CBDO, COO, Facilitator Tomato, CIGs
5.	Marketing	• Accidents and injuries during loading and off-loading. • Contamination and deterioration of fruits due to excessive use of traditional woven baskets. • Destruction of fruits by pests. • Fruit wastes and losses during transportation	•	• Use of proper method and appropriate aid tools for loading and off-loading. • Provide adequate storage facilities in aggregation centres. • Use of Returnable Plastic Crates. • Ensure the use of IPM Plan. • Use of appropriate means of transportation.	Ensure the use of proper method and aid tools.	Farmer/ Marketer, ESS, APS, RIE, WYEL, CBDO, COO, Facilitator Tomato, CIGs

Table 6.9: Mitigation Measures for Significant Potential Adverse Impacts for Tomato Processing

S/N	Activities	Environmental and social impact	Key Receptors	Mitigation measures	Monitoring	Responsibility
	Production of dried tomato	• Generation of solid wastes and wastewater. • Product contamination due to improper sanitation and hygiene during drying of sliced tomatoes.	Farmers, Processors, Marketers	• Proper waste management • Use of standard drying facilities	• Ensure the implementation of waste management plan • Ensure the use of proper drying facilities	Processor, ESS, APS, RIE , CBDO, WYEL, Facilitator Tomato, CIGs
	Production of tomato Paste	• Improper site selection process. • Procurement of poor-quality machines and equipment • Increase in amounts of dust and exhaust fumes from vehicle movement on the site • Generation of solid wastes and wastewater. • Product contamination due to improper sanitation and hygiene in processing plant • Improper inclusion of food additives and related chemicals in the finished product.	Farmers, Processors, Marketers	• Ensure proper site selection procedures. • Ensure all procurement, construction and installation activities follow approved standard. • Ensure the innovation of simple tomato processing machines. • Sprinkling of water to minimize dust • Proper waste management • Use of standard protocols for sanitation and hygiene in plants • Ensure the use of standard food processing protocols approved by NAFDAC. • Ensure that trees are planted in the area.	• Ensure the suitability of the site for tomato paste production. • Ensure the implementation of waste management plan • Provide simple tomato processing technology. • Ensure adherence to standard protocols. • Ensure that IPM Plan is strictly adhered to. • Sensitize the processors on the need to plant trees around the plant.	Processor, ESS, APS, RIE , CBDO, WYEL, Facilitator Tomato, CIGs

CHAPTER SEVEN

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

The ESMP is conceived to ensure that the impact mitigation measures proposed are effectively implemented by the project and its stakeholders. This chapter enlists and discusses the framework for the mitigation measures taken to address the adverse impacts identified in chapter six. It also discusses the fundamentals of the environmental and social management plan. Furthermore, it outlines the institutional responsibilities and accountabilities that will ensure that all the provisions are implemented under strict supervision. In addition, the cost implication of monitoring all the identified avenues was also outlined. More importantly, the mitigation measures outlined in this report are structured to curtail the potential adverse environmental and social impacts itemized in the previous chapters.

7.1: Objectives of the ESMP

The objectives of the ESMP are to mainly outline the following issues:

- The identification of environmental and social impacts arising from the intervention projects such as road construction, processing infrastructure, farm inputs (herbicides, fertilizer, tractors) etc.
- Proposed mitigation measures corresponding to each of the impacts identified and the implementation of such mitigation measures.
- Propose a waste management plan for wastes that will be generated from the project activities.
- The program to monitor proposed mitigation measures; and
- The budgetary allocations for the implementation.

7.2: The Environmental and Social Management Plan

The ESMP is conceived to ensure that the impact mitigation measures proposed are effectively implemented by the project and its stakeholders. This ESMP contains descriptions of the mitigation and monitoring measures to be adopted by Kano APPEALS Project, which must be integrated into its budget and implementation plan. It shows the specific impact, the respective mitigation, the monitoring approach, the stakeholders responsible to supervise the mitigation procedures and suggested actions.

7.3 Institutional Arrangements, Responsibilities and Accountabilities

The roles and responsibilities of the executor of the project and adequate institutional arrangements are vital to the efficient execution of the environmental and social safeguard measures outlined in this ESMP. Thus, details of the institutional arrangements and the roles

and responsibilities of the diverse institutions in the implementation of the ESMP are discussed below:

7.3.1 Project Management Unit

The Federal Ministry of Agriculture and Rural Development (FMARD) has the overall responsibility for executing the Project. To account for the new project's activities and associated design as well as to address the weaknesses observed during the execution of the CADP, all the implementation entities will be strengthened and implementation arrangements would be revised accordingly. There will be two levels of oversight committee structures both at the Federal and State levels consisting of the National Steering Committee (NSC) and State Steering Committees (SSC); and two major operational organs: National Coordinating Office (NCO) and States Coordinating Offices (SCOs) respectively.

At the Federal level, the NCO will coordinate project activities on behalf of the FMARD, who has the overall responsibility for the execution of the project. The NCO will play the traditional role of project implementation units and will be responsible for implementing the day-to-day project activities, coordinate the work of the different actors at the federal level, prepare periodic reports and provide support to all the SCOs. The NCO also will be responsible for consolidating the reports received from SCOs that will be part of the overall project progress report. The NSC will be responsible for the overall project oversight, review project monitoring reports on advances in project implementation, approval of Annual Work Plans and budget at the NCO level, and reviewing progress of the project implementation across the participating states.

The NSC shall comprise largely of the highest echelon of the Federal Ministry of Agriculture and Rural Development and shall be chaired by the Honourable Minister of Agriculture and Rural Development or by Permanent Secretary of FMARD as a designated representative. The NSC will be constituted of representatives of the different ministries and agencies that are involved in the project execution. From time to time, the NSC can invite relevant agencies whose activities will have a bearing on project execution.

At the State level, coordination will be carried out by the Kano State Coordination Office (KSCO). The KSCO coordinates and facilitates project coordination in Kano State and is responsible for preparing monitoring reports, coordinate work with the NCO, preparation of the annual work plans and budgets, facilitating the work and provide the periodic reports to SSC and NCO. The KSCO has a reporting responsibility to SSC and NCO. Figure 7.1 shows the organogram of the Kano State APPEALS coordinating office.

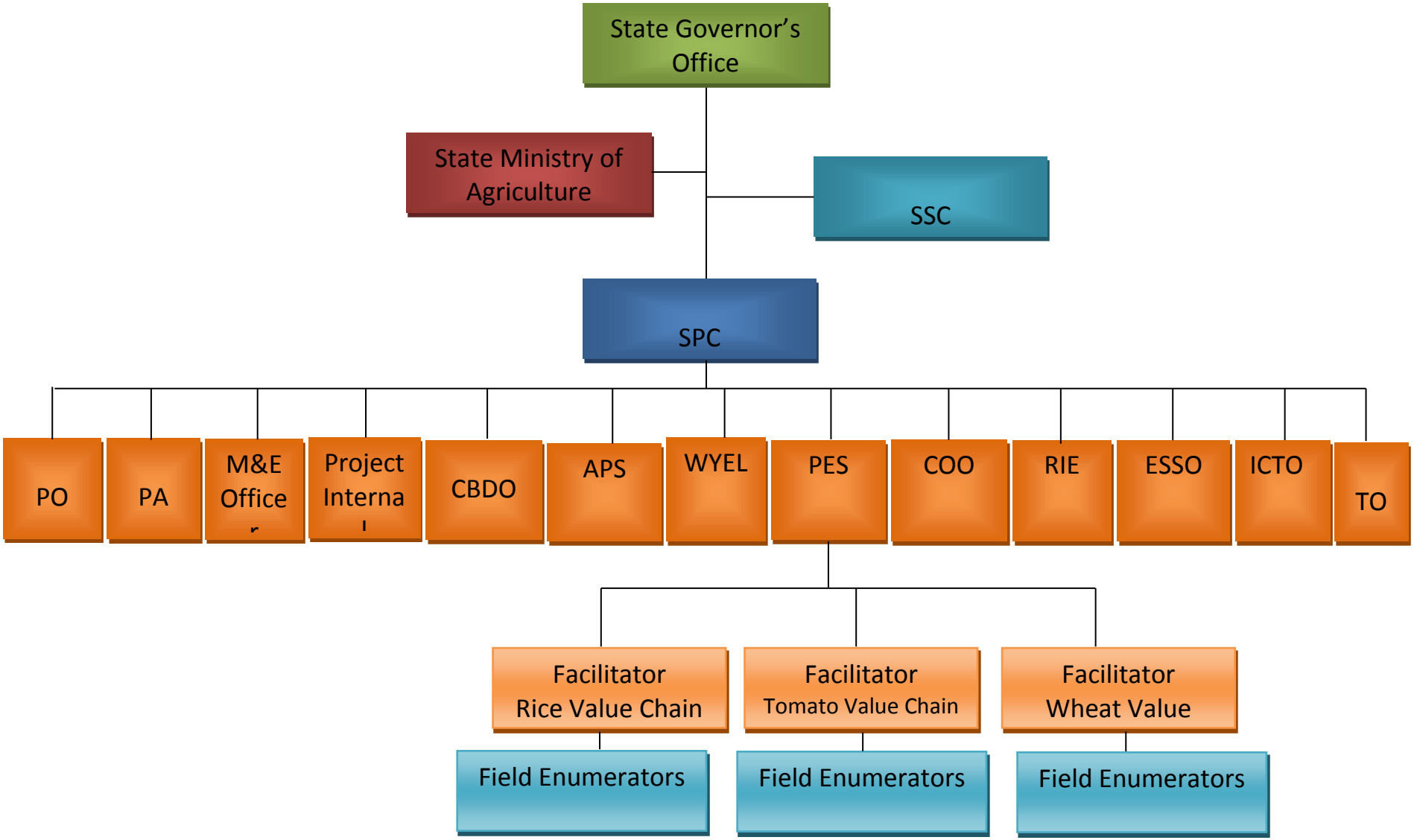

Figure 7.1: Kano State APPEALS Organogram

The existing SCO in each of the participating States is responsible for managing the financial affairs of the project at their respective states. Specifically, the SCO is responsible for (i) preparing activity budgets, monthly project bank account reconciliation statement, quarterly Statement of Expense (SOE), Withdrawal Schedule, quarterly Interim Financial Reports (IFRs), and annual project financial statements; and (ii) ensuring that the project financial management arrangements are acceptable to the Government and IDA. It will also forward the reports and statements to Kano State Ministry of Agriculture, Kano State Ministry of Finance; and IDA.

Oversight policy and strategic orientation functions will be performed by the State Steering Committee (SSC), chaired by the Deputy Governor. The composition of the SSC includes but not limited to relevant Commissioners and Permanent Secretaries, having the SCO as the secretariat. The SSC will approve annual work plans and budgets, review annual implementation reports, ensure alignment of project activities with the state government programmes and guide on collaboration among similar projects and agencies with relevant activities to the project operating in the respective states. Given that the utilization of the resource will have an impact on the amount of funding flowing to each state, the SSC closely follows and facilitates the periodic utilization of funding available under the project.

Supervision oversight function will be performed by the technical implementation management committee to be chaired by the State Commissioner of Agriculture and Natural Resources, including key representation from Directors in charge of priority value chains and programmes in the State and representatives from NCO and SCO. The technical committee is responsible for reviewing the quarterly report and providing the technical guidance on issues arising from the project implementation. It is also responsible for reviewing and recommending the annual work plan and budget as well as periodic monitoring of project implementation in the State.

7.3.2 Environmental and Social Safeguards Unit

To ensure sustainability in all the Agro-Processing; Productivity Enhancement and Livelihood Improvement Support Project and sub-project activities; an environmental and social development safeguards unit has been formed at both the NCO and SCOs which includes the environmental and social development safeguards officer that reports directly to the National Project Coordinator or State Project Coordinator as the case may be. The paramount objective of the environmental/social safeguards officers is to ensure the effective consideration and management of environmental and social concerns in all aspects of Agro-processing; productivity enhancement and livelihood improvement support project, from the design, planning, implementation, monitoring and evaluation of initiatives. Thus, a key function of the Environmental and Social Safeguard Officer is to engender a broad consensus, through participatory methods and extensive dialogue on the potential environmental and social concerns from project civil works as incorporated into the World Bank's Environmental and Social Safeguard Policy/standards triggered by the project and environmental compliance with the EA department of the Federal Ministry of Environment.

With this, particular attention is directed at minimizing environmental and social risks associated with the development of sub-project initiatives, as well as the identification and maximization of social development opportunities arising from investments. In the implementation of the project, and for all environmental and social issues, the safeguard unit shall work closely with other relevant MDAs in preparing a coordinated response on the environmental and social aspects of the sub-projects.

The roles and responsibilities of the Environmental and Social Safeguard Officer to anchor environmental and social issues distinctively are to:

- ✓ Review all ESIAs/ESMPs documents prepared by environmental and social consultants and ensure adequacy under the World Bank Safeguard policies.
- ✓ Ensure that the project design and specifications adequately reflect the recommendations of the ESIAs/ ESMPs;
- ✓ Co-ordinate application, follow up processing and obtain requisite clearances required for the project, if required;
- ✓ Prepare compliance reports with statutory requirements**;**
- ✓ Develop, organize and deliver training program for the NCO and SCOs staff, the contractors and other persons involved in the project implementation.;
- ✓ Review and approve the Contractor's Implementation Plan for the environmental measures, as per the ESIA and any other supplementary environmental and social studies that may need to be carried out by the SCO;
- ✓ Liaise with the Contractors and the NCO/SCO / MDAs on implementation of the ESMPs;
- ✓ Liaise with various Central and State Government agencies on environmental, resettlement and other regulatory matters;
- ✓ Continuously interact with the NGOs and community groups that would be involved in the project
- ✓ Establish dialogue with the affected communities and ensure that the environmental and social concerns and suggestions are incorporated and implemented in the project;
- ✓ Review the performance of the project through an assessment of the periodic environmental and social monitoring reports; provide a summary of the same to the Project Manager, and initiate necessary follow-up actions;
- ✓ Provide support and assistance to the Federal and State Government Agencies and the World Bank to supervise the implementation.

It should be noted here that, the Kano State APPEALS Coordinating Office has a competent Environmental and Social Safeguards Officer. The roles of the State Environmental and Social Safeguards Officer include:

- Assisting SCO to comply with and fully implement World Bank Safeguard Policies and other relevant laws in Nigeria.

- Taking lead in ensuring adequate screening and scoping of project in the Agro-Processing; Productivity Enhancement and Livelihood Improvement Support Project for the appropriate safeguard instruments.
- Ensure adequate review of all safeguard reports before sending to the Bank, Supervision of the contractors, supervisors, training of contractors and workers, monitoring of the implementation of the ESMP and other safeguard instruments

7.4 ESMP Measures

The subsequent sections of this chapter provide a framework for the content of the ESMPs envisioned for the Kano APPEALS in the Study area, as the SCO progresses through the agricultural development project in the State. These ESMPs will be expanded to include specific procedures to guide implementation by project personnel and contractors; and to provide for periodic updates as necessary. The plans include:

7.4.1 Flora and Fauna Management Plan

The primary purpose of the Flora and Fauna Management Plan is to protect the biodiversity of the area from any unintended damage due to the Kano APPEALS development and operation, and to protect the project personnel from dangers associated with the native flora and fauna. This plan will include the following provisions as well as others that may be identified as it is further developed:

- Animals shall not be handled, removed, killed or unnecessarily disturbed by the Kano APPEALS support project or its employees, or by the Kano APPEALS's contractors or their subcontractors' employees;
- The Kano APPEALS will not tolerate poaching of fauna or flora by its personnel or by any of its contractors or subcontractors;
- The Kano APPEALS will ensure through a High Conservation Value study that all High Conservation Value Forest sites are properly marked and left untouched;
- The Kano APPEALS will help to maintain the integrity and quality of biodiversity in the project area;
- Land clearing operations are expected to cause removal of indigenous trees during preparation operations for the various Kano APPEALS intervention / support activities, however, advice of the Forestry Division of the Ministry of Environment should be sought and considered;
- The Kano APPEALS intervention is to occur over a period of five years. The Kano APPEALS should plan its development projects in advance to minimize the impact on the fauna, help identify and control impacts on flood zones to result in a lower amount of biomass to manage;
- The Kano APPEALS shall ensure that the site is kept clean, tidy and free of garbage that would attract animals;
- In order to reduce the risk from invasive species, the monitoring program for the interventions should track what types of invasive species occur, where they occur,

how they were most likely introduced to the area, how they were eradicated, and the success of the various eradication measures. If any of the staff identifies a continuing problem with invasive species, it should determine the root cause of that problem and investigate additional measures to address the root cause;

7.4.2 Waste Management Plan

The plan will provide detailed information on waste management including the amount and type of waste to be generated, the sources, and the existing waste management practices in the processing sites and proffer mitigation measures, which will involve:

- Sensitization by Kano APPEALS, the individual beneficiaries, contractors, CIGs and the project staff on the need for effective waste management in and around the project sites throughout the sub-project activities.
- Sensitization and mobilization by Kano APPEALS, on the adverse consequences of poor waste management.
- Minimization of waste production at the project activities sites.

7.4.2.1 Recommended Measures for Waste Management

The plan details how wastes that will be generated at the project sites will be managed in an environmentally sustainable and socially acceptable manner. To be practical and effective in handling wastes the fundamental principles of wastes management should be followed by Kano APPEALS, and which include:

- Identify and classify the type of wastes generated (solid or liquid; biological or chemical; degradable or non-degradable etc). Proper procedure must be taken regarding their collection, storage, transportation and disposal.
- Identify and demarcate in conjunction with REMASAB, disposal areas clearly indicating the specific materials that can be deposited in each.
- Dispose all wastes in authorized areas.
- Identify, demarcate and enforce the use of within-site access routes to limit impact to farm.
- Establish and enforce daily site clean-up procedures, including maintenance of adequate disposal facilities for farm and processing wastes.
- Plant trees around the project sites.

The procedure for practical management of wastes that will be generated from the sites is highlighted below:

- There should be adequate number of labeled garbage bins and containers made available at strategic areas of the sites. The use of plastic bin liners should be encouraged.

- All organic and inorganic materials will be placed and/or disposed of so as not to impact on any watercourse or groundwater directly or indirectly.
- The placement and disposal of all such products and materials will be done in an environmentally acceptable manner.
- Solids and other pollutants generated as a result of installation and operation or those removed during the course of treatment or control of wastewaters will be disposed of in a manner that prevents their direct or indirect re-entry into any watercourse or ground waters.
- Any waste material that is inadvertently disposed in or adjacent to watercourses will be removed immediately in a manner that minimizes adverse impacts, and the original drainage pattern should be restored.
- Waste materials should be placed and stored in containers. Storage areas and containers will be maintained in a sanitary condition and shall be covered to prevent spreading of wastes by water, wind or animals.
- All food wastes (farm and processing) should be collected and stored in containers at appropriate locations and should be emptied at regular intervals and the collected wastes should be transported to Government designated waste management facilities.
- Best approaches must be applied in handling and disposing of wastes.
- The Kano APPEALS must develop a list of all wastes generated at the different facilities with estimated quantities of each on a monthly basis or other time interval, particularly Hazardous Wastes like empty agrochemical substances containers (e.g. fertilizers, pesticides, fungicides; petrochemical substances containers (e.g. oil, grease, lubricants); used lubricants; and used towels soaked with oil and grease or lubricants.
- The Kano APPEALS should engage accredited waste disposal contractors and obtain a Certificate of Accreditation from each to ensure that they are operating legally.
- The Waste Management Supervisor must ensure that periodic inspections are conducted of waste management practices to ensure compliance with this plan.

7.4.3 Erosion and Sedimentation Management Plan

The Erosion and Sedimentation Management Plan will provide the guidance to control soil erosion and the transport of sediment to surface waters. Soil erosion is a major soil degradation process affecting the soil quality not only by directly reducing nutrients and organic matter levels, but also by affecting soil properties such as infiltration rates.

Erosion could occur during land clearing in rice, wheat and tomato fields when the soil is left uncovered. Related activities that could cause this erosion include the construction of access roads and development of drainage works. The top layer of soil is the most vulnerable and unfortunately tends to be the most fertile soil. Soil suspended as solids in the water column can physically enter the waterways and obstruct them. Soil erosion can also transport agrochemicals such as fertilizers and pesticides, which adhere to the suspended solids.

All exposed soil areas in the project area will be managed through a diversified set of measures and strategies that minimize the risk of erosion and run-off, control the flow of storm water over exposed soil areas, retain sediments within the cleared areas as much as possible, and control erosion and run-off downstream of the cleared areas. These measures are grouped and presented below.

The Kano APPEALS shall monitor the effectiveness of erosion and run-off control through a systematic verification of compliance with control measures implemented through monitoring of impacts to surface water quality downstream (turbidity) and run-off accumulation at streams and natural drainage channels downstream of construction fronts.

7.4.4 Employment, Training and Awareness Management Plan

The Employment, Training and Awareness Management Plan will be required both during the implementation phase and operations. For both phases, the following will be incorporated, as appropriate:

- During the new employee orientation process, all workers will receive health and safety training on standard work processes and other health and safety requirements applicable to their work activities;
- All workers at work fronts will receive weekly safety orientations that last at least 15 minutes. If significant accidents occur or other health and safety issues arise, these orientations may be supplemented;
- The training status for all workers will be recorded;
- Health and safety training will be detailed in the Integrated Health and Safety Plan (IHSP) that will specify the contents, target groups, frequency and forms of evaluation of each type of training to be applied. It will include at least the following modules:
    - Induction health and safety training;
    - Community relations training;
    - First aid;
    - Venomous animals;
    - Use of PPE; and
    - Safe Work Procedures.

7.4.5 Water Management Plan

The Water Management Plan will address water conservation, protection of water resources, responsibly using surface water and groundwater for farming and farming activities plantation and mill purposes and practicing rainfall harvesting, where these are appropriate. The important aspects of this plan will be:

- Training of all workers to ensure that they understand the significance of protecting all water sources;

- Implementation of measures contained in the Erosion and Sedimentation Management Plan to control sedimentation of surface water resources and minimize the loss of nutrients and therefore the need for chemical fertilizers;
- Implementation of the measures contained in the Chemical Management Plan to ensure that all chemicals used on the site are used properly and in the minimum necessary quantities to control adverse impacts to surface and groundwater;
- Implementation of the measures contained in the Waste Management Plan to ensure that all wastes generated on the site are properly stored and disposed to control adverse impacts to surface and groundwater by liquid effluents or by leachate from solid wastes;
- Monitoring significant effluent streams on a periodic basis to ensure that they meet applicable discharge requirements;
- Developing and implementing a site-specific water quality monitoring plan for both surface water and groundwater to ensure that management measures are achieving the desired results; and
- Development of parameters for the installation of water wells to ensure that the wells meet all the applicable national standards and that they do not have significant adverse impacts on other groundwater users.

7.4.6 Chemical Management Plan

The Chemical Management Plan will provide details for the acquisition, storage, application, use, and disposal of all pesticides, herbicides, fertilizers and other chemicals used in the nurseries, farms, mills and other project infrastructure.

Improper usage and application of fertilizers can pollute the soil and the groundwater in the area.

This program will use chemical, cultural, biological, and physical practices to control the infestations. High levels of other chemicals (e.g. pesticides, insecticides and fungicides) in the surface and underground water can affect the supply of freshwater for human use.

This Chemical Management Plan will be developed to ensure that chemical use is minimized and when chemicals are used, that they are used safely and responsibly. For pest control, the Kano APPEALS will utilize a specially created Integrated Pest Management Plan. Decisions on schedule, application process and quantities of chemicals applied, if they are necessary, will be based on detailed analysis of soil characteristics, existing and likely pests, bio-control options and safe and available chemical control options. It will include requirements for farmer training and safe application practices for farmers/workers, the environment, and surrounding communities. The use of agrochemicals is resource extensive. Thus, the application of fertilizer should be based strictly on the analysis requirements. The use of organic fertilizer will minimize the impacts of the chemicals in the soil and the surface and underground waters. Fuel dispensers must be used by well-trained personnel to prevent accidental spillage.

Chemical usage for weed control will be minimized using the following types of practices for immature plantings:

- Rice, wheat and tomato fields should be kept weed-free through manual weeding;
- hormonal herbicides (e.g. 2,4-D amine and triclopyr) will be avoided;
- excessive spray drift and scorching on lower fronds will be avoided through careful control of areas that are sprayed;
- Spraying will be limited to the minimum amount required to treat specifically identified weed problems.

The Chemical Management Plan will include the following important aspects:

- agrochemicals should be properly stored and handled to avoid spills;
- Farmers/workers will be informed of the dangers of agrochemicals and trained on the proper methods to handle, use and dispose of the chemicals and their used containers incorporating all appropriate elements of the IFC guide for ―Pesticide Handling and Application;
- the application of pesticides and fertilizers will be in strict accordance with the manufacturers' instructions and generally established safety procedures;
- every chemical product will have its own Material Safety Data Sheet (MSDS);
- Kano APPEALS will not make use of Persistent Organic Pollutants (POP) banned under the Stockholm Convention, which came into force on the 17th of May 2004 and which Nigeria adhered with.

This International Convention banned: Aldrin; Chlordane; Dieldrin; Dioxinx (PCDDs); DDT; Endrin; Furans; Heptachlor; Hexachlorobenzene; Mirex; Polychlorinated biphenyls; and Toxaphen.

- The Kano APPEALS will implement a proper Monitoring and Surveillance System (MSS) for pests. The MSS will provide information on pests presence and activity to determine the right time to control a particular pest. This systematic pest control strategy will result in an effective control with minimal chemical usage and minimal damage to other living organisms and the environment.

7.4.7 Air Quality Management Plan

The Air Quality Management Plan will include the following important aspects:

- noise levels in construction sites, mills and other Project areas shall meet Nigerian requirements;
- all boilers used in the Project, especially for processing rice and tomato should be of modern construction to minimize emissions of NOx and other pollutants;
- all project vehicles used for transportation will be properly maintained and fitted with standard pollution control equipment to minimize emissions;

- The Kano APPEALS will study the potential for capturing methane generated from rice and wheat production and use that methane for energy production at its mills to decrease emissions to the atmosphere;
- The Kano APPEALS will avoid the use of ozone depleting substances for uses such as coolants or cleaning operations.

7.4.8 Vegetation Clearing and Biomass Management Plan

The Vegetation Clearing and Biomass Management Plan will ensure that all vegetation clearing and biomass management for all aspects of the Kano APPEALS activities will be conducted in accordance with detailed procedures that will meet the requirements of Nigeria as well as best practices outlined by Roundtable Sustainable Agriculture (RSA).

Site clearing for farm access road development, nursery establishment, mill development and infrastructure development can damage the habitats of terrestrial flora and fauna species. If clearing is not done properly, it could result in the removal of ecologically important habitats and species.

This plan will include procedures for the following:

- delineating areas to be cleared;
- specifying methods for clearing in various types of areas or terrain, including methods to allow fauna to relocate out of the area to be cleared;
- specifying procedures for utilizing and/or disposing of the biomass generated by the clearing activities

This plan will be used in conjunction with the Employment, Training, and Awareness Management Plan and the Erosion and Sedimentation Management Plan to ensure that workers/farmers, the environment and surrounding communities are protected.

7.4.9 Emergency Response and Incident Management Plan

The Emergency Response and Incident Management Plan will include procedures for addressing all reasonably foreseeable and possible emergencies such as:

- fires;
- floods;
- spills or releases of hazardous chemicals or wastes to the soil, surface water and groundwater;
- medical emergencies; and,
- other weather-related emergencies

The Emergency Response and Incident Management Plan will define the methods of intervention and required resources to be implemented by the Kano APPEALS in the event of an accident to protect staff and property and to prevent harmful effects on the local population and the environment. As part of the plan, the Kano APPEALS will facilitate the

alert of rescue services and inform competent relevant authorities. Spills are the release of substances (solids or liquids) in a magnitude that could cause substantial negative effects to the system receiving it. The system in question could be, for example, soil, water or the atmosphere. The spill response aspects of the plan will be outlined for all employees and relevant employees will be trained in specific spill response procedures for the substances for which they are responsible.

The impacts of spills can have very adverse effects on the environment and humans. Spills can occur during many of the typical operations such as refuelling of equipment, painting, changing oil during transfer of the liquids or solid from container to another, rinsing drums containing liquid or solid that is harmful; they may also occur as a result of a burst hose or pipe, the malfunctioning of an overflow valve of a tank or road accident of a fuel tanker. The Emergency Response and Incident Management Plan will include the following features to address spills or release of hazardous materials:

- identify the personnel responsible in the event of a spill as well as a hierarchy for notifications;
- provide the structure for a spill response organization;
- characterize the different types of materials and potential quantities of spills that could occur as a result of the Kano APPEALS intervention;
- outline spill response procedures as well as equipment, protective equipment and materials to support the response;
- provide specific training guidelines and procedures for personnel to ensure a safe and effective response to potential spill events; and
- provide training guidelines for recovery and disposal of all materials contaminated in the event of a spill.

7.4.10 Cultural Heritage Management Plan

The Cultural Heritage Management Plan will ensure that known cultural sites are identified and adequately protected and that a procedure is put in place for identifying any unknown or unmarked sites that may be encountered during development (Chance Find Procedure). In order to mitigate impacts to known sites, the Kano APPEALS will demarcate, along with each affected village and community, the cultural and sacred sites used by that village and community for traditional practices, so that those sites can be excluded from any vegetation clearing or other construction activities.

During the course of construction, if any artifact or human remains are discovered, work in the immediate vicinity shall be halted immediately and the Kano APPEALS will implement a Chance Find Procedure that will include the following:

- Kano APPEALS' RIE coordinator shall take reasonable precautions to prevent any person from removing or damaging any such item;
- all work will be moved at least 30 m away from the artifact, or outside the boundaries of the site containing the artefact;

- the local village Chiefs and Government Officials will be notified of the 'find' to determine whether it is significant from a cultural perspective;
- if the artefact appears to be pre-historic, the national museum will be notified; and, appropriate actions will be taken after consultations with the relevant authorities.

7.4.11 Traffic and Vehicle Management Plan

The Traffic and Vehicle Management Plan will include the following provisions:

- The Kano APPEALS will place speed limits and appropriate road signage along all Project roads;
- The Kano APPEALS will enforce speed limits for safety, air quality and noise purposes both on the Project site and its immediate environment;
- all Kano APPEALS drivers would be trained by a road safety specialist; and
- all vehicles should be properly maintained and undergo periodic safety inspections.

7.4.12 Social Investment Plan

The Social Investment Plan outlines the types of measures that the Kano APPEALS will consider as it develops the project intervention to assist the communities in and around the project area to benefit from the presence of the project. Some of the programmes being considered by the Kano APPEALS as part of its Social Investment Plan include:

- assisting in the provision of support through Women and Youths activities, value chain activities in production, processing and marketing of maize, poultry, ginger, dairy and fishery.;
- using a portion of the agricultural wastes (e.g. rice husk) as fuel for cooking, domestic and industrial source of energy where applicable , to decrease the need for fuel woods;
- providing technical assistance to out-growers as well as a market for agricultural products grown on farms;
- improving the provision of health care services to both its workers, farmers and the broader community in the Project area;
- improving the provision of potable water to both its workers/farmers and the broader community in the Project area;
- improving the provision of educational services to both its workers/farmers and the broader community in the Project area;
- providing access to electricity to project affected communities at low cost;
- providing scholarships for deserving local students; and
- providing priority for employment to local residents where applicable.

7.4.13 Health, Safety and Security Management Plan

The Health, Safety, and Security Management Plan for the Project will comply with all Kano State requirements as well as international best practices. It will address measures for hygiene, health, and safety at the work place and include an on-going training program for all employees project beneficiaries. The Kano APPEALS will provide the necessary safety equipment for its employees. The plan will address issues such as:

- the proper provision and use of Personnel Protective Equipment (PPE) such as safety boots, respirators, eye goggles, noise protection, hand gloves and face masks;
- analysis of risks associated with job activities in order to develop standard requirements for PPE on a job-specific and station-specific basis;
- provision of training on the proper use of PPE and penalties for their improper use;
- training on the proper and safe use of all equipment in workshops, garages, the farms, nurseries, and mills;
- physical barriers so that unauthorized personnel are not admitted to areas where dangerous equipments are in use;
- training related to job-specific risks and activities, including:
    - electrical installations (e.g. electric shock on direct contact with conductors and indirect contact with masses powered up, burns, fire and explosion);
    - mechanical equipment (e.g. tool blasting or matter risk, crushing of fingers, wounds, equipment shock);
    - lifting devices (e.g. crushing risk, injury caused by appurtenances, falling, collision); machinery and vehicles (e.g. risk of accident on contact with other materials, collision with or knocking down of persons, obstacle shock, fall by the operator, collision with a vehicle or machine);
    - hand tools, electric or other welding equipment (e.g. risk of injury, electrocution, poisoning, dazzle);
    - workshops and garages (e.g. risk of mechanical injury, shock and collision with machines);
    - oven, sterilizers and boilers (e.g. risk of burns due to heat and steam from furnace, explosion risk); and
    - power plant, processing lines and workshops (e.g. noise-related risks, electrocution risks) provision of properly trained and equipped first aid personnel including a well-stocked pharmacy, a treatment room with beds and an ambulance for any worksite injuries.

Health and safety management plan is aimed at ensuring that operations undertaken by Kano APPEALS in the office and on-site are conducted with zero accidents and incidents through the elimination or reduction of known hazards. The Kano APPEALS will:

- Train staff on fire safety techniques and first aid
- Provide adequate fire extinguishers
- Provide adequate PPE

- Provide emergency routes and exits
- Provide signages such as no smoking, no tresspass
- Provide first aid equipment
- Provide ambulance

Table 7.1: Risk Safety Control

Risk	Monitoring	Control
Fire	APPEALS Kano SCO	- Train staff on fire control techniques and use of equipment - Provide fire detection devices like smoke alarms - Make available fire warn devices - Make available fire extinguishers and fire blankets - Provide escape routes and exits - Paste emergency fire service phone numbers: Kano state fire service (07051246833, 08098822631); Federal Fire Service (08058689461, 08032003557) - Provide signage on exists and equipment - Federal Airport Authority of Nigeria; Malam Aminu Kano Airport (08082579650, 064-430741) - Red cross 08066009513
Health	APPEALS Kano SCO	- Train staff on first aid - Provide adequate first aid equipment/kits - Inform workers and staff where to set the first aid treatment - Provide ambulance - Put signages such as no smoking - Provide PPE Assist local dispensaries, with training, facilities such as mosquito nets and medicines to cater for prevalent diseases in the communities such as malaria, typhoid, dysentery, tuberculosis and urinary tract infections.
Security	APPEALS Kano SCO	- Train adequate security staff to secure the sites and offices - Provide adequate security equipment - Ensure that all offices have lockable doors - On-site materials must not be unsecured - Paste Nigerian Police Force, Kano distress numbers (08032419754, 08123821575) on notice boards

Table 7.2: Emergency Response Plan for Kano APPEALS

Activity	Monitoring	Responsibility
Prepare emergency response plan and team	- Ensure adequate number of emergency routes - Provide luminous signages within the offices and sites. - form an emergency response team	Kano APPEALS SCO
Prevent Injuries	- Inform staff regularly about minor and major incidences - Provide adequate signages on perceived areas of high risks e.g fire, electricity e.t.c.	Kano APPEALS SCO
Reduction of damages to equipments and buildings	- Ensure emergency lighting, power, fire alarm system, fire extinguishers, fire hose and stand pipe	Kano APPEALS SCO
Protection of the environment and the community	- Sensitize the community using electronic and print media on how to response to risk	Kano APPEALS SCO
Training for life saving techniques	- First aid - Fire fighting - Mock drills - General safety measures	Kano APPEALS SCO

7.4.14 Community Health and Safety Plan

The purpose of the Community Health and Safety Plan is to address the potential impacts of the project on the human population living in and around the farm settlement. These mitigation measures include:

- construction activities can draw significant numbers of single men and others attracted by the opportunity to provide goods and services to construction workers and project beneficiaries with disposable income. Some of these activities such as alcohol, drugs, and sex trade can lead to increased crime and diseases, including HIV/AIDS and Covid-19 thus the Kano APPEALS will encourage contractors to recruit most of their construction workers from the immediate area especially for infrastructure development, thereby minimizing the number of single men migrating for work;

- The Kano APPEALS will also ensure that it and its contractors provide adequate training and enforcement codes of conduct to minimize worker participation in risky activities such as sex trade, drugs, and alcohol;
- The Kano APPEALS will conduct sensitization of local communities regarding the potential impacts from construction workers and inform those communities about the terms and conditions of Kano APPEALS's worker Code of Conduct;
- The Kano APPEALS will conduct community training and awareness programs to ensure that the local population understands the risks of participating in risky economic activities for short-term economic gain; and
- The Kano APPEALS will work closely with the health facilities of the Ministry of Health in the State and promote sensitization campaigns to help the local population avoid risky activities; and Kano APPEALS will work closely with the health facilities to monitor the incidence of diseases and other health measures that have indicated a need for further intervention to protect community health and safety.

7.4.15 Stakeholders Engagement Plan

The Kano APPEALS has been implementing its Stakeholders Engagement Plan since the inception of the project invention. It includes the following major considerations:

- identification of project stakeholders;
- summary of past consultation efforts;
- stakeholder's engagement and implementation of some of the APPEALS components especially youths and women empowerment;
- stakeholder engagement during various studies including the GRM, ESIA etc;
- stakeholder engagement during operations;
- resources for stakeholder engagement; and
- monitoring and reporting on stakeholder engagements

a. In coordination with its Stakeholders Engagement Plan, the Kano APPEALS has developed and is implementing a Grievance Procedure that include the following components:

- anyone may contact the Project via seven accessible communication channels: in person, by email, by Facebook, or twitter, through committees, or complain boxes, or by telephone to submit a grievance;
- contacts about grievances may be by the affected person or through an agreed local liaison committee;
- all complaints will be documented by the Kano APPEALS and tracked to resolution, and information on the status will be available to the person making the complaint;
- The Kano APPEALS will investigate the complaint, using technical assistance if necessary;
- determine the response including, if applicable, proposed actions;

- The Kano APPEALS will inform the person making the complaint, either verbally or in writing, of Kano APPEALS□s response and proposed actions (if any);
- the grievance mechanism will inform complainants of their options if the complaint cannot be resolved;
- The Kano APPEALS will strive to investigate and resolve complaints promptly;
- there will be no cost to the person presenting the complaint;
- all complaints will be treated with appropriate confidentiality;
- complaints will be investigated and resolved without retribution to the complainant or other persons; and
- project personnel, especially those who have contacts with the public, will be briefed/trained about the grievance procedure, including who to contact within the Kano APPEALS or the Government of Kano State about a complaint.

7.4.16 Training Programmes

Kano APPEALS will develop, implement and track training programs which is to include:

- the benefits of protecting indigenous trees and tree planting activities;
- the need for waste management and how to implement the Waste Management Plan;
- the need for proper selection, handling, storage, application, use, and disposal of all hazardous materials and chemicals used in the Project activities in accordance with the Chemical Management Plan;
- implementation of all emergency response procedures as identified in the Emergency Response and Incident Management Plan;
- implementation of the Cultural Heritage Management Plan and associated Chance Find Procedure;
- implementation of the Health, Safety and Security Management Plan for all employees; and
- specific programs identified in the Community Health and Safety Plan.

7.4.17 Coronavirus (Covid-19) Safety Management Plan

Coronavirus (Covid-19) safety management plan is to protect the contractors, workers and staff of the APPEALS project against infection with covid-19. The plan would comply with all covid-19 protocols, as provided by the National Center for Disease Control (NCDC) and the Kano State Government. The Kano APPEALS would:

- Form a Covid-19 response committee
- Provide Covid-19 screening instruments such as remote thermometers.
- Provide mechanical hand washing basins at all the entrance to the offices and at construction sites.
- Make available hand sanitizers for all staff and workers
- Provide face masks for all the staff and workers
- Train security personnel on screening the staff and entire workers

- Ensure that social distancing is maintained in the workplace
- Sensitize all the staff, contractors and workers on the need to adhere to the covid-19 protocols
- Provide adequate and safe waste disposal bins to evacuate used face masks, hand gloves and PPE

7.4.17.1 Workers safety under Coronavirus (Covid-19)

The safety of workers and the staff of Kano APPEALS is paramount and therefore, all necessary provisions to ensure their safety must be put in place. Kano APPEALS would:

- Provide adequate information to the staff and other workers about the emergency situation on Covid-19.
- Enforce as a routine exercise the culture of putting face masks, washing hands for at least 20 seconds with soap and hygienic running water, observance of social distancing of at least six feet (2 meters).
- Staff that work efficiently at home should be allowed to do so to reduce crowding.
- Staff that must be physically available in the offices should work on "shift" or "alternating" basis.
- Meeting should be virtual; or at least communication should be on phone or through emails
- In case a physical meeting becomes necessary, use large halls that could provide the stipulated distance of two meters, and not more than fifty (50) attendants.
- Discourage travels among staff and workers within or outside the country.
- Disinfect regularly all the surfaces of items that are frequently touched like doorknobs, keyboards, telephones, desks and all handles in the workplace.
- Advise any worker who has serious health condition to as a matter of emergency report to hospital

Provide and post in all consecutive areas in the APPEALS offices and workstations the Kano Covid-19 toll free phone numbers (090 9399 5333, 090 9399 5444, 080-COVIDKN, 080 0268 4356) and NCDC toll free number: 6232 for emergency cases. A sensitization poster for the Kano APPEALS is developed as:

7.5 Monitoring

The Project will develop a detailed Environmental and Social Monitoring Plan to monitor the key elements of both the biophysical and human environments. The purpose of this monitoring will be to ensure that significant impacts were correctly identified in the assessment process, then to monitor the effectiveness of the mitigation measures. The results of monitoring activities will be regularly reviewed to determine if existing management measures are adequate, or if those measures should be revised or supplemented.

Monitoring will include aspects such as:

- water quality of the effluent streams discharged from the farms, workers' and farmers' houses, nurseries and processing plants of rice, wheat and tomato;

- invasive species;
- the effectiveness of waste management activities; for wastes generated from the farms, processing plants and markets of rice, wheat and tomato;
- the effectiveness of sediment and erosion control measures;
- implementation of the Cultural Heritage Management Plan;
- compliance with the Traffic and Vehicle Management Plan;
- health and safety indicators, including accidents, for all farmers, millers, parboilers and workers;
- grievances of farmers, farmers and the local community;
- health indicators in the local communities to inform any modifications to the Community Health and Safety Plan; and
- flora and fauna in the Project Area.

7.6 Grievance Redress Mechanism (GRM)

A grievance Redress Mechanism is a problem solving instrument and a process made available to allow PAPs settle their complaints and grievances amicably. It is an effective tool for early identification, assessment and resolution of complaints on the project. All PAPs were fully informed of their rights and of the procedures for addressing complaints during the consultation meetings. The mechanism for resolution of complaints and grievances is established by Kano State Coordinating Office of the Agro-processing, Productivity Enhancement and Livelihood Improvement (APPEALS) in 2019.

The Grievance Redress Mechanism (GRM) is part of the broader process of stakeholder's engagement, accountability, quality and compliance assurance in the project designed for solving disputes at the earliest possible time, which is in the interest of all parties concerned. This shall further be made tighter in all future ESIAs/ESMPs once the specific sites of the various project/subproject investments are known since there are different LGAs and communities affected.

The objectives of the grievance redress mechanism are to:

- provide an effective avenue for aggrieved persons to express their concerns and resolve disputes that are caused by the project;
- promote a mutually constructive relationship among farmers, community members, project affected persons, government and investors;
- prevent and address community concerns;
- assist larger processes that create positive social change; and
- identify early and resolve issues that would lead to judicial proceedings.

7.6.1 Kano APPEALS GRM Process

It should be stated that Kano APPEALS has developed its GRM procedure. Considering that the three-value chain being supported by the Kano APPEALS have similar operational attributes, a one size fits all approach was adopted for the design of its GRM, especially for the uptake of grievances at the project beneficiaries' (Cluster) level.

The core institutional blocks for the Kano APPEALS GRM include the following:

- Farmers Cluster;
- Traditional leaders;
- Women leaders in the various beneficiary communities;
- Youth leaders in the various beneficiary communities;
- Local council representative;
- Field Officers/Enumerators;
- Value Chain Facilitators;
- Environmental/Safeguard Specialist (GRM Coordinator);
- Environmental Officer;
- Agro-Processing Specialist;
- Communications Officer;
- Rural Infrastructure Engineer;
- M&E Officer;
- Training Officer;
- State Project Coordinator;
- Kano State Citizens' Mediation Centres (Under Justice Sector);
- Department of Women Affairs in the state Ministry of Women Affairs;
- Women's right focused NGOs(like HURFON, HRN);
- Media (Print and Electronic);
- Nigeria Police.

7.6.1.1 Stages of Complaint and Appeal Levels

An effective GRM must provide the opportunity for a complainant to seek a higher level of redress if they are not satisfied at the lower level. In essence, six stages of complaint with five appeal levels have been developed for the Kano APPEALS GRM. These include:

1. Cluster-based GRC;
2. Community-based GRC;
3. Kano State Coordination Office/PMU GRC;
4. National Coordination Office GRC;
5. Citizen Mediation Centre;
6. Law Court.

The introduction of the Kano State Citizen Mediation Centre into the hierarchy of Kano APPEALS GRM is to ensure that the aggrieved person through independent mediation has his/her compliant resolved. However, if the complainant is still not satisfied at this level, he/she can then opt for formal legal procedure at the law court. The structure of the GRM is shown in Fig. 7.2 and a brief description and composition of each of these GRM stages is provided in subsequent sections.

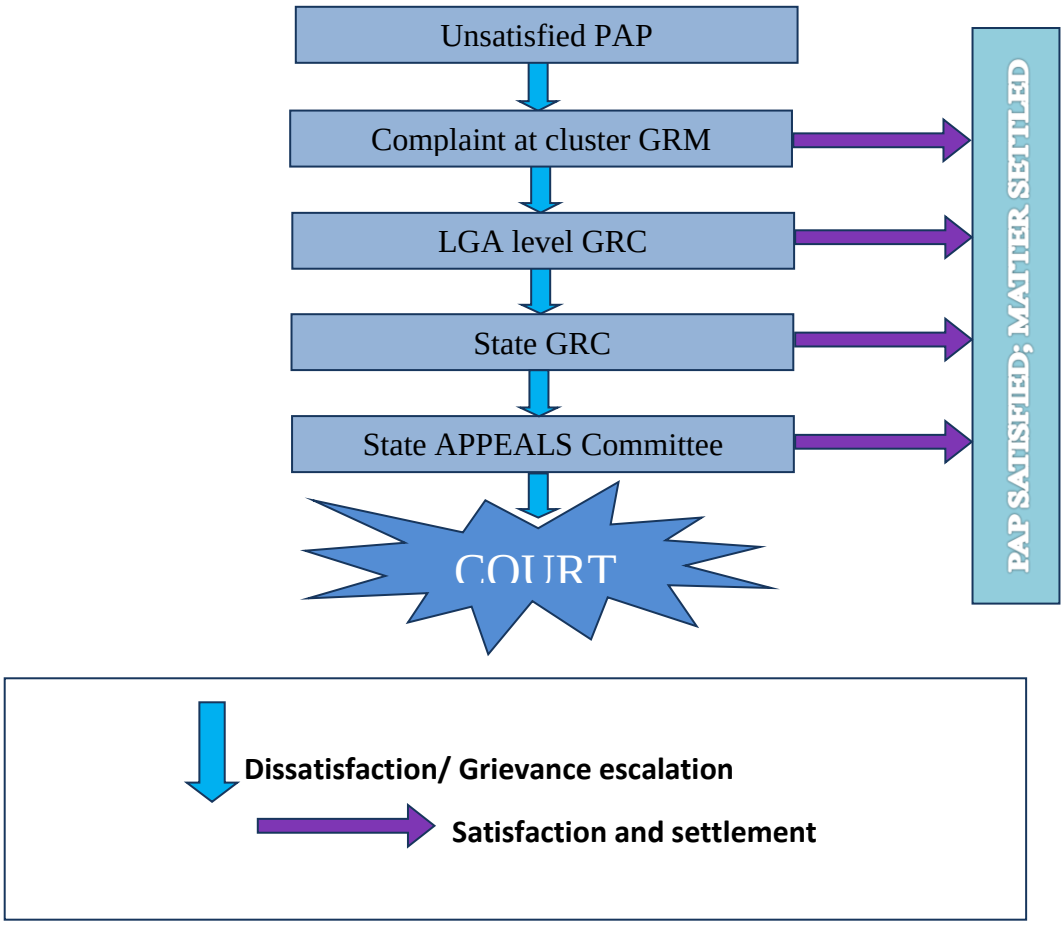

Fig. 7.2 Kano APPEALS GRM Structure

- Cluster-based GRC

The cluster-based GRC is the first and lowest grievance redress mechanism in the Kano APPEALS GRM. The GRC at this level is expected to resolve simple project-activity related issues between; members of a cluster; members of the cluster and other members of the community; members of a cluster and the contractor. The Cluster-based GRC in Kano APPEALS consists of 6 members per cluster, with at least a woman. Composition of the Cluster-based GRC includes:

a. The Cluster Chairman,
b. The Representative of the community/traditional institution.
c. Two floor member from amongst the farmers elected through consensus during clusters meeting.

d. Kano APPEALS Field Officer/Enumerator (Secretary)

The election of the floor member representative shall take into account the requirement of minimum two women in the Cluster based GRC. If this requirement has not been met, the elected member must be a woman.

Each cluster must ensure that they discuss and display complaints procedures and available uptake channels in ways that are easily accessible to their members and members of the community. The uptake channels at this level should include among others; verbal complaints to members of the GRC, written complaints in complaint boxes in the community, through phone calls to the chairman and/or secretary telephone lines. All complaints are expected to be resolved and the complainant officially notified within 15 Days of receipt of the complaint by the Cluster-based GRC PRO. Where additional time is required, the complainant is updated of actions being taken within every 7 Days until the complaint is resolved. In all, the complaint at this level is expected to be resolved within 30 days. However, after a complaint is certified unresolvable at the cluster level or the issue requires arbitration, the Cluster-based GRC secretary will refer it to stage two, which is the Community-Based GRC.

- Referral to Community-based GRC

The Community-based GRC are expected to resolve project activity-related issues like trespass into private property by project activity, exclusion claims, labour or workforce related issues and any other serious grievances that could not be resolved at the cluster level. The members of the community-based GRC shall be made up of nominated executive members representing value chain clusters within a local council. The nomination of members of the GRC shall involve a participatory process to take place in well publicised town hall meetings and driven jointly by the farm clusters/CDA/Cooperative/CAMS and representatives of Kano APPEALS Coordination office. Local interest groups such as relevant NGOs/CSOs, respected citizens in the communities and reputable community associations shall also participate in the selection of the GRC members.

The GRC at this level shall include:

- ✓ The Community Leader;
- ✓ The President, Kano State Rice Farmers Association of Nigeria or his Representative;
- ✓ The President Kano State Wheat Farmers Association of Nigeria or his represe ntative;
- ✓ The President Kano State Tomato Farmers Association or his representative.

Members of the APPEALS Project which include the following;

- ✓ Productivity Enhancement Specialist;
- ✓ The three value chain facilitators;

- ✓ Women and Youth Empowerment Specialist;
- ✓ Agro-processing Specialist;
- ✓ Environmental Officer;
- ✓ Monitoring and Evaluation Officer;
- ✓ Rural Infrastructure Officer;
- ✓ Communication Officer;
- ✓ Procurement Officer; and
- ✓ LGA Agricultural Extension Officer in the Community.

Complaints referred by the Cluster-based GRC shall be received and recorded by the Secretary of the community-based GRC. Feedback from the community-based GRC to a complainant shall not exceed 7 workdays. A complainant who is not satisfied with the feedback on outcome of the mediation by the community-based GRC shall have their grievance referred to the Kano State Coordination Office GRC.

- Referral to Kano State Coordination Office/PMU GRC

  The Kano Coordination Office GRC is expected to resolve project-activity related issues such as: resettlement and compensation for damages; Gender Based Violence (GBV) or sexual exploitation; contractor impunity or highhandedness etc. This committee shall be the apex authority of the Kano APPEALS GRM which will make recommendations for action to the State Project Coordinator (SPC) in the case of issues of extreme importance, or make referral to the National Coordination Office in the case of grievances that are either unresolvable at the committee level or found to be extraneous to the execution of the project. The Kano APPEALS Coordination Office Grievance Redress Committee was established and chaired by the Director, Legal Draft, Ministry of Justice, Kano State. The Livelihood Safeguards Officer of the Kano APPEALS serves as the Secretary. The full membership of the committee comprises of:

  a. Director, Special Services, Ministry of Agriculture and Natural Resources;
  b. Director, Administration and general Services, Ministry of Environment;
  c. Director, SARC, Ministry of Women Affairs;
  d. Director, Agric. Services, Ministry for Local Government;
  e. KNARDA, Director, Agric. Services;
  f. Civil Defence, Agric. Officer;
  g. *Hisba*, Legal Officer;
  h. Traditional Leader;
  i. Secretary, All Farmers Association of Nigeria;
  j. Secretary, *Miyetti Allah*;
  k. Chairman, ALGON
  l. The Environmental Officer Kano APPEALS Project (Safeguards);

  The Kano APPEALS Coordination Office GRC is expected to finalise mediation on grievances within 10 working days. The complainant/survivals confidentiality should

also be kept in mind when reporting any incidences to the police or referral to the CMC.

- Referral to National Coordination Office

  The National Coordination Office GRC will be the highest forum within the project for redressing the grievances received from the beneficiaries, stakeholders and other concerned. The committee, while handling a complaint may requisition any staff for its assistance and/or may constitute a special committee if required.

- Referral to Citizen Mediation Centre (CMC)

  Cases referred to the CMC are usually unresolved prolonged cases that are deemed fit for referral by the Kano Coordination Office GRC. The complainant is adequately briefed at this point about the need for a higher level of independent and transparent mediation. As indicated earlier, there are CMC offices in each senatorial districts of Kano. The Coordination Office is expected to exhaust all available avenues for settlement based on the principles of Alternative Dispute Resolution before allowing a complainant decide that they are not convinced about the resolution reached and would wish to take the matter up to a law court.

- Referral to Law Court
  The law court is the final stage where grievances are expected to be resolved in this GRM.

7.6.1.2 Grievance Uptake Points

The grievance uptake points in this GRM are based on the Stages of Complaint and Appeal Levels and include the following:

- Cluster-based GRC:
  - Farmers Cluster/CDA/Cooperative office;
  - Complaint/Suggestion box in Cluster office or other designated places (Palace of the traditional ruler, Market square etc);
  - Telephone calls to the GRC Chairman or the Secretary;
  - Text messages and WhatsApp to the GRC Chairman or the Secretary;
  - Complaint through the traditional ruler, religious heads and other reputable personalities in the community.
- Community-based GRC:
  - Verbal complaint to the members of the Community GRC;
  - Written complaint physically submitted to the secretary of the GRC;
  - Complaint/Suggestion box in the office or other designated places (Palace of the traditional ruler, Market square etc);
  - Verbal complaint to the GRC Chairman or the Secretary over the telephone;

- Written complaint sent through Text messages and WhatsApp to the Chairman or the Secretary;
- Complaint reported through the traditional ruler, religious heads and other reputable personalities in the community;
- Complaint reported through the local council.

- Kano State Coordination office/PMU GRC:
  - Kano APPEALS Website;
  - Kano APPEALS Facebook page;
  - Complaint/Suggestion box in the office or other designated places;
  - Kano Ministry of Agriculture;
  - Kano Ministry of Environment.
- National Coordination Office GRC/Office
  - Referral from Kano State Coordination Office
- Citizens' Mediation Centre:
  - Referral from the National Coordination Office;
  - Petition from aggrieved individuals;
  - Walk in by aggrieved persons to make their complaints;
  - Transferred to the Citizens Mediation Centres (CMC) from court for amicable mediation; and lastly
  - Telephone Calls to the CMC and the case would be entertained.
- Law Court:
  - Referral from the CMC.

7.6.1.3 Grievance Redress Procedures

The procedure for grievance redress is as follows:

- Receipt and Registration of Feedback or Grievance

The first step for any project beneficiary or complainant to benefit from the Kano APPEALS GRM is the presentation of a grievance at a grievance uptake point at the cluster-level. The Cluster-based GRC Secretary will receive grievances from the complainant via verbal presentation, the Complaint/suggestion box placed at traditional ruler's palace, market square, CDA/Cluster/Cooperative/CAMS office in the community, telephone calls, Email, physically/verbally etc and acknowledge. The complaint will then be registered and a logbook of grievances will be maintained. Sample of a grievance registration form can be found in Annex V.

Cases related to GBV and personal details of the complainant will however not be documented in the public grievance log book. In case a GBV complainant decides to provide any information, the complainant/survivals confidentiality should be kept in mind when attending to such or when reporting any incidences to the police.

The receiver (preferably the cluster-based GRC Secretary) will clarify the primary information, register and acknowledge receipt of it to the grievant immediately or within

a maximum of 2 days. The acknowledgement is to give the complainant an assurance that the complaint has been received and is receiving necessary attention or has been resolved. The registration will capture the following data: Reference Number, Date of the feedback or grievance, Name of the complainant, Gender of complainant, Address, Contact Phone Number (E-mail, if applicable), Category of the grievance and Signature. A complaint or feedback can also be submitted anonymously or via a third party.

Complaints and feedbacks made in writing and those made verbally by persons that cannot read or write shall be transcribed by the receiver as appropriate and read back to the complainant to ensure agreement. All complaint submitted irrespective of its sources shall be acknowledged with a corresponding acknowledgement sent to the complainant. Sample of a grievance acknowledgement receipt can be found in Annex VIII.

- Verification/Screening of Grievances

The receiver of grievance will then consult and make enquiries within the areas of grievance. The investigation will determine among other things whether the matter has any relationship with the Project or whether it can be handled at the level where it is presented. In the case of GBV/SEA complaint, this will not be investigated but rather referred to the appropriate authority and GBV service provider around the project area. If the complaint is rejected, the complainant is informed of the decision and the reasons for the rejection within 2 days of registration of the complaint or feedback. Any complaint that is rejected shall have the benefit of a first hearing at the Community GRC level and then referred to the appropriate level/authority for redress.

Reasons why a complaint or feedback may be deemed not eligible and rejected may include:

i. The complaint does not pertain to the project;
ii. The issues raised in the complaint does not fall within the scope of issues the grievance mechanism is authorized to address; and
iii. The complainant has no standing to file e.g. not a member of the project community and not affected by the project activities.

Facts must be established against the interest and goal of the grievant to build trust. Fact finding is essential to redress, but not applicable to GBV/SEA cases under this GRM. It should be noted that grievances spring from differences in expectations, interests, knowledge or lack of it, needs and fears.

Complaints in the Kano APPEALS GRM should be classified under the following categories:

Category 1: Physical and/or economic displacements caused by land acquisition or any other project activities

Category 2: Security, Crime and Enforcement Issues (including GBV)

Category 3: Labour issues

Category 4: Environmental Pollution issues

Category 5: Cultural issues

Category 6: Exclusion claims

- **Gender Based Violence (GBV) and Sexual Exploitation and Abuse (SEA)**

  Gender Based Violence (GBV) is one of the most oppressive forms of gender inequality, posing a fundamental barrier to the equal participation of women and men in social, economic and political spheres. The World Bank's Inter-Agency Standing Committee defines GBV as An umbrella term for any harmful act that is perpetrated against a person's will and that is based on socially ascribed (gender) differences between males and females. Though both partners could be victims, but females are more prone and vulnerable.

  All complaints related to GBV shall be treated in a private and confidential manner, limiting information to what the survival or complainant is freely willing to provide. A separate register shall be opened for this category of cases and shall ONLY be accessed by the community-based GRC secretary, the GRM coordinator at the Kano Coordination Office (and any female GRC member empowered to handle GBV cases where the Chairman and Secretary are all male). The complainant (if a survival) shall be attended to with empathy, assurance of safety and confidentiality. In the event that the complainant is not willing to divulge any information, this view should be respected by the GRM officer, and the complainant referred to the appropriate nearest medical centre, approved available GBV service provider or police, depending on the complainant's choice. Such a complaint should be reported to the World Bank Task Team as well by the Kano Coordination Office GRC.

Other considerations for the handling of GBV/SEA grievances include:

- No GBV data on anyone who may be a survival should be collected without making referral services available to support them;
- All GBV complaint should be referred to the right service provider and other relevant institutions, information to be requested should be limited to:
  - The nature of the complaint (what the complainant says in her/his own words without direct questioning);
  - If, to the best of their knowledge, the perpetrator was associated with the project; and
  - If possible, the age and sex of the survivor.

- **Implementation and Case Closing**

This is the period where the complaint or feedback passes through the full cycle and a feedback is agreed. The resolution of the committee at the various levels is documented. (Sample format for the recording of grievance proceeding can be found in Anne VI). Where there is a need for external referral of the matter, the complainant will be appropriately guided on the next steps. The result of the process can vary. The request of the complainant may be turned down, compensation may be recommended, or management may simply apologise to the grievant. The SPC, Kano Coordination Office must provide oversight for timely and adequate resolution of disputes.

- **Feedback**

At the time of the acknowledgement of the feedback or grievance, the complainant will be provided with the following information:

i. Grievance Reference Number to facilitate monitoring and reminders by complainants;
ii. Expected time of redress (Prescribed maximum time limit for redress is three months);
iii. If not addressed within expected time, action to be taken by complainant.

If the grievance is not redressed within the expected time, the complainant shall be provided with the following information:

i. Information on reasons for delay;
ii. Updated expected time of redress;
iii. If not addressed within expected time, action to be taken by complainant.

At the time of final redress, the complainant will be provided with information on the

i. Final action taken for redress and
ii. Avenues for pursuing the matter further

All responses to the complainant in a grievance redress process must be communicated in writing to the complainant. The officer responsible for the uptake of the grievances will follow up on the responding authorities for cases referred to be able to establish when each grievance has been resolved.

7.6.1.4 Roles and Responsibilities of Grievance Redress Implementers

The Kano APPEALS GRM shall be driven and coordinated by the Environmental/Safeguard Specialist. The specialist is going to be supported by the M&E specialist among other supporters. However, it is essential to create a home or focal point for the GRM and integrate such into the Project's Management Framework. The M&E officer shall be responsible for compilation and reporting of all beneficiary complaint and feedbacks tracked in the process

of grievance reporting and redress by the GRCs while the Communication Officer shall provide the necessary publicity and media coverage of all procedures. Additional support shall be provided to this team through external social experts and firms where and when required. These responsibilities are explained in details below:

Environmental/Safeguard Specialist

- Coordination of the entire GRM;
- Documentation of the GRC proceedings, decisions, and recommendations;
- Registration of grievances using a prescribed form;
- Facilitation and provision of information and services to resource persons as required by the Grievance Redress Committee (GRC) to deal with the reported grievances;
- Maintenance of grievance-related documents, reports, and attendance and payment registers of GRC members;
- Coordination of the grievance uptake channels, ensuring that they are adequately resourced;
- Liaise with the Communications Specialist of the Coordination office for publicising the Kano GRM channels, structure and other essential project communication strategies;
- Liaise with community-based GRC to track and record complaint and resolution reached;
- Liaise with the Citizens' Mediation Centres in the project states, for possible referral of unresolved grievances and tracking of reported complaints;
- Facilitating arrangements for field inspections;
- Handling all payments and expenses related to GRM operations;
- Providing feedback to affected persons and agencies involved in grievances;
- Reporting progress to the Coordination office and World Bank in required formats;
- Planning and executing GRM trainings;
- Planning and executing GR evaluation and refining the GRM process for continuous improvements.

Cluster-Based GRC

- Operate and manage uptake points for complaints and resolving complaints;
- Promptly refer grievances certified as UNRESOLVABLE to community-based GRC;
- Monitor and provide feedback on environmental and social impacts and effectiveness of mitigation measures at the cluster level;
- Provide monthly/quarterly report on grievances to the Coordination office through the Environmental/Safeguard Specialist;
- Partake in development and implementation of grievance prevention sub-plans.

Community-based GRC

- Settle disputes at community level;
- Operate dedicated telephone hotline(s) for complaints;
- Partake in training programs;
- Partake in participatory planning with contractors for conflict prevention e.g. onsite food vendors plan, local labour engagement plan etc.;
- Project information dissemination;
- Coordination of town hall meetings and other stakeholder engagements.

Community-based GRC Secretary

- Manage day to day operations of GRC in project beneficiary community;
- Arrange and partake in Grievance Resolution Sessions;
- Register new complaints using agreed formats;
- Manage complaint boxes and other grievance uptake channels;
- Provide monthly/quarterly report on complaint to the Coordination office through the Environmental/Safeguard Specialist;
- Facilitate pasting of posters, distribution of brochures and other information dissemination materials in communities;
- Operate dedicated telephone hotline(s) for complaints.

State Coordination Office GRC

- Resolve and address complaints referred from the Community GRC;
- Consider and determine corrective measures in the light of comments and suggestions received by GRC and/or recommended by Community GRCs;
- Analyze data on grievances and using this to make informed decisions;
- Referring to the NCO GRC unresolved grievances at the state level.

National Coordination Office GRC

- Resolve and address complaints referred from the State Coordination GRC;
- Constitute special committees, if required under un-usual circumstances for Redress of grievance of exigent nature and/or for resolutions of complaints requiring broader inquisitorial procedures;
- Referring unresolved grievances to the CMC.

Citizens' Mediation Centres

- Settle disputes that could not be resolved within the APPEALS administrative structure.

7.7 Labour Influx, Child Labour and Gender Based Violence (GBV)

7.7.1 Labour Influx

The project may face the problem of an influx of non-local resident's labour and working conditions issues as skilled labourers might not be available in some of the project sites. The project will take concrete measures to mitigate all potential labour influx-related risks such as workers' sexual relations with minors and any resulting pregnancies, presence of sex workers in the community, the spread of STIs/HIV/AIDS, sexual harassment of female employees, child labour and abuse, increased dropout rates from school, inadequate resettlement practices and fear of retaliation, failure to ensure community participation, poor labour practices and road accidents. These risks require careful consideration to improve social and environmental sustainability, resilience and social cohesion. To this end, the project will include mitigation measures such as: (a) assessing living conditions of workers' camps and ensuring appropriate living conditions; (b) establishing and enforcing a mandatory Code of Conduct for the company, managers and workers, and an Action Plan for implementation; (c) ensuring appropriate location for these camps; (d) taking countermeasures - indicated in the Social Management Plan - to reduce the impact of the labour influx on the public services; and, (e) devising and implementing a strategy for maximizing employment opportunities for local population, including women.

The following guidelines lay out the principles that are key to proper assessment and management of the risks of adverse impacts on project area communities that may result from temporary Kano APPEALS induced labour influx.

- The Kano State Coordination Office will ensure that the contractors, farmers and consultants hire, to the maximum extent, skilled and unskilled workers from affected communities in the project area. The Kano State APPEALS Coordination Office will adopt or implement all possible measures to minimize, if not avoid, labour influx into the project area.
- The Kano State APPEALS Coordination Office will assess and manage labour influx risk based on appropriate instruments such as those based on risks identified in the ESIA and the Bank's sector-specific experience in the country.
- Risk factors to the Kano State APPEALS Coordination Office that should be considered, include,
    - weak institutional capacity of the implementing agency;
    - predominant presence of contractors without strong worker management and health and safety policies;
    - anticipated high volumes of labour influx;
    - pre-existing social conflicts or tensions;
    - weak local law enforcement;
    - prevalence of gender-based violence and social norms towards it in the community (acceptance of gender-based violence);
    - prevalence of transactional sex;

- local prevalence of child and forced labour;
- existing conflict situation between communities;
- absorption capacity of workers to the community (See http://pubdocs.worldbank.org/en/497851495202591233/Managing-Risk-of-Adverse-impact-from-project-labour-influx.pdf)

- The Kano State APPEALS Coordination Office will be required to incorporate social and environmental mitigation measures into the beneficiary activities and civil works contract and responsibilities for managing these adverse impacts. This will be a binding contractual obligation on the Kano State APPEALS Coordination Office, with appropriate mechanisms for addressing non-compliance

7.7.2 Child Labour

The project may also face child labour and abuse especially from farmers. This may increase school children dropout rate. Child labour specifically relates to underage workers who should be in schools acquiring knowledge and skills as well as forced labour. The project will establish and enforce a mandatory Code of Conduct for the company, managers and workers, and an Action Plan which will prevent child and forced labour at all the phases of the project. The safeguards officer shall be responsible for monitoring the farm performance and adherence to the child labour obligations. The Kano State APPEALS Coordination Office through the Safeguards Officer shall ensure total compliance to the Kano APPEALS child labour policy of none involvement of underage workers by individual and organizations (contractors and consultants) in the implementation of the proposed intervention.

7.7.3 Gender Based Violence

7.7.3.1 GBV Risk Management Mechanisms

A GBV workshop to be conducted to sensitize the SCO staff on the key principle and specific requirements to address GBV/SEA have been included in the bidding documents ('pre-qualification' and 'employers' requirements') for infrastructures. It should be included into the individual beneficiary agreement. As such specific measures to reduce and mitigate the risk of GBV/SEA in the project will be well taken. Such measures will include:

i) GBV/SEA assessment of project;
ii) mandatory contractors' code of conduct on sexual harassment for infrastructural development;
iii) appointment of NGO to monitor GBV/SEA in Kano APPEALS;
iv) community and workers' sensitization on GBV/SEA;
v) provision of additional referral units for survivors of GBV/SEA;
vi) provisions in contracts for dedicated payments to contractors for GBV/SEA prevention activities against evidence of completion;
vii) requirement to ensure a minimum target of female employment with incremental rewards of the obtainment of this target.

The following **actions** are recommended for immediate implementation:

- Hiring of a dedicated GBV/SEA specialist or retraining Safeguards Officer for the project;
- Including in the focal NGO's ToR services for managing social risks associated with GBV/SEA in the project;
- Building and improving NCO/SCOs, local communities and other relevant stakeholders' capacities to address risks of GBV/SEA by developing and providing guidance, training, awareness and dissemination of relevant GBV/SEA materials to communities;
- Developing a clear Kano APPEALS specific internal "Reporting and Response Protocol" to guide relevant stakeholders in case of GBV/SEA incidents;
- Strengthening of operational processes of Kano APPEALS states project area on GBV/SEA;
- Identify development partners and cultivating pragmatic partnership on GBV/SEA prevention measures and referral services;
- Developing Codes of Conduct for civil works contractors with prohibitions against GBV/SEA;
- Strengthening consultations and operationalizing GBV/SEA specific grievance redress mechanisms;
- Providing financial support implementation of the GBV/SEA actions described herein, including training and awareness building for various stakeholders;
- Establishing an inter-ministerial committee to advance GBV/SEA actions described above.

Overall, GBV risks in the project target areas might include Intimate Partner Violence (IPV), public harassment including potentially verbal insults, physical abuse, rape, harmful widowhood practices and women and child trafficking. Targeted support to women under the program could potentially exacerbate these risks. Development and implementation of specific GBV risk prevention and mitigation strategies, suitable to local contexts, will be critical. Guidelines for situation analysis of GBV and safe reporting guidelines in line with international best practices will be implemented. Furthermore, all risks related to labour influx will have to be mitigated by participation of project beneficiaries/communities and involvement of project contractors and contractors' workers and consultant employees, in identifying mitigation and implementing measures, including developing mitigation instruments such as the "Labour Influx Management Plan" and the "Workers Camp Site Management Plan".

7.7.3.2 Guiding Principles in the Care and Management of Victims of Gender Based Violence

Organizations that are signatories to the Standard Operating Procedure (SOP) including the World Bank agree to adhere to a set of guiding principles aimed at ensuring staff are committed to integrating GBV into their work and are adequately skilled to do so; and aimed at ensuring their programmes are gender sensitive, collaborative and participatory. There are four guiding principles and skills to care for GBV survivors and these include: Right to Safety, Right to Confidentiality, Right to Dignity and Self Determination; and Right to Non-Discrimination.

7.7.3.3 General Code of Conduct on Preventing Gender Based Violence and Violence Against Children

All actors involved in prevention of and response to GBV should understand and sign a Code of Conduct or a similar document, setting out professional standards of conduct. Humanitarian agencies have a duty of care to beneficiaries and a responsibility to ensure that beneficiaries are treated with dignity and respect and that certain minimum standards of behaviour are observed.

To prevent sexual exploitation and abuse, the following core principles must be incorporated into all agencies codes of conduct:

- Sexual exploitation and abuse by workers constitute acts of gross misconduct and are therefore grounds for termination of employment.
- Sexual activity with children (persons under the age of 18) is prohibited regardless of the age of consent locally. Mistaken belief in the age of a child is not a defence.
- Exchange of money, employment, goods or services for sex, including sexual favours or other forms of humiliating, degrading or exploitative behaviour is prohibited. This includes exchange of assistance that is due to beneficiaries.
- Sexual relationships between workers and beneficiaries are strongly discouraged since they are based on inherently unequal power dynamics. Such relationships undermine the credibility and integrity of humanitarian aid work.
- Where a worker develops concerns or suspicions regarding sexual abuse or exploitation by a fellow worker, whether in the same agency or not, she/he must report such concerns via established agency reporting mechanisms.
- Workers are obliged to create and maintain an environment which prevents sexual exploitation and abuse and promotes the implementation of their code of conduct. Kano APPEALS and contractors have responsibilities to support and develop systems which maintain this environment.

To ensure the maximum effectiveness of the Code of Conduct, it should be posted in clear view in the public areas of each actor's office/center, introduced and explained, signed by all staff and kept in employee files. All posted and distributed copies of the Code of Conduct should be translated into the appropriate language of use for the field area.

7.8 Stakeholder/Citizen Engagement

Stakeholders' engagement is essential in achieving the major objectives of any project implementation and sustainable development. Participatory approaches in project planning and implementation enhance project policy, ownership and sustainability and also empower targeted beneficiaries.

The objectives for stakeholders' engagement and sensitization include but not limited to the following;

i. To create general public awareness and understanding of the project, and ensure its acceptance;

ii. To develop and maintain avenues of communication between the project proponent, stakeholders and beneficiary farmers in order to ensure that their views and concerns are incorporated into the project design and implementation with the objectives of reducing, mitigating or offsetting negative impacts and enhancing benefits from the project;

iii. To inform and discuss about the nature and scale of possible adverse impacts of the rehabilitation work and to identify and prioritize the mitigation measures for the impacts in a more transparent and direct manner;

iv. To document the concerns raised by stakeholders and PAPs so that their views and proposals are mainstreamed to formulate mitigation and benefit enhancement measures;

v. To sensitize other MDAs, local authorities, Non-governmental Organizations (NGOs) and Community Based Organizations (CBOs) about the project and solicit their views and discuss their share of responsibility for the smooth functioning of the overall project operations;

vi. Reducing conflict between stakeholders, project proponents, PAPs; and

vii. To develop stakeholder's capacity in the areas sustainable project management.

Additional entry points for stakeholders' engagement in monitoring include collaboration with local CBOs/NGOs, communities, local academia or think-tanks in gathering results data and conducting joint evaluations of project results after project completion (including in the preparation of project Implementation Completion Reports). Capacity building will be an integral part of the stakeholder's engagements.

Envisaged Benefits

The envisaged benefits of the Stakeholders engagement and sensitization exercises include;

- Provision of opportunities to foresee and/or resolve potential obstacles, constraints and conflicts;

- Means to identify and address potential negative social and environmental impacts as envisaged by stakeholders;
- Opportunities to generate social learning and innovations based on local field experiences;
- Means of ensuring that project benefits are distributed equitably, and
- Strengthened working relations between stakeholders; Federal and State Governments, etc., and the World Bank.

7.8.1 Fundamentals of Stakeholder Engagement Approach

Consultations

Meaningful consultations can contribute to improved design, implementation, and sustainability of developmental interventions. The objectives of consultations include receiving inputs for improved decision-making about the design and implementation arrangements of a developmental program or project, to contribute to improved results and sustainability. In this context, consultations can potentially give voice to the needs of different population groups, including the vulnerable and marginalized groups; improve risk management by identifying opportunities and risks from and to a project; and increase transparency, public understanding, and stakeholder involvement in development decision-making.

Consultations with key stakeholders, including the project-affected people and the civil society, are mandatory in developmental projects so as to satisfy *"best practices"*. Consultation methods include public hearings or meetings, focus group discussions, household surveys and interviews, electronic consultations, and advisory/expert groups. In addition, consultations can include informal structures at the local level, such as village councils and women's groups. Good practice approaches to consultation, including closing the feedback loop, need to be applied more systematically.

Collaboration

Collaboration with stakeholders in decision-making processes and events can make decisions more responsive to stakeholder needs and improve the sustainability of program and project outcomes through increased ownership by stakeholders. Mechanisms for collaboration include stakeholder/user membership in decision-making bodies, integrity pacts, participatory planning and budgeting, and stakeholders' juries.

Collecting, Recording, and Reporting on Inputs from Stakeholders

Stakeholders' feedback can be collected periodically on various dimensions of public services provided, such as effectiveness, inclusiveness, quality, delivery time, transaction costs, and targeting, as well as on resource utilization or engagement processes. Tools include satisfaction surveys, focus group discussions, hotlines, community scorecards, stakeholder report cards, or SMS/online feedback

However, the Kano State APPEALS has been implementing its Citizen/Stakeholders Engagement Plan since the inception of the Project. Major milestones covered so far in this respect include:

- identification of Project stakeholders;
- summary of past consultation efforts from baseline study and GIS mapping;
- establishment of site committees

Other planned consultation efforts to prepare for construction activities include;

- stakeholder engagement during consultancy services;
- resources for stakeholder engagement; and
- monitoring and reporting on stakeholder engagement.

7.9 Training Programmes

The Kano State APPEALS Coordination Office should develop, implement and track training programmes at SCO and community/cluster levels. Table 7.1 describes the institutional capacity strengthening plan, which should be followed at the SCO and community levels.

Table 7.3: Institutional Capacity Strengthening Plan

S/N	Capacity Needs	Participants	Subject	Resource Person	Duration	Cost (US$ $)
1	Personnel require appreciation of WB's, Federal/State environmental policies, as well as, an application of these policies in implementing the World Bank support for Kano APPEALS intervention project.	**SCO Training** SPC, Environment and safeguards specialist, Project engineer and Social safeguards specialist. The estimated number of participants is Ten (10) persons	In-depth consideration of the mitigation measures proffered by the ESIA.	Environmental science specialist	4 days seminar	6,000
2	Kano APPEALS institutional arrangement.	**Community / Beneficiary** Kano APPEALS intervention project Community Farmer Environmental Committee (CFEC) members. The estimated number of participants is Twenty-Five (25) persons.	General environmental awareness; seminars that will include ecological and social science principles, as it affects the Kano APPEALS intervention project site. Mitigation measures proffered in the ESIA, GBV issues, GRM.	Environmental science specialist	1-day workshop	8,000
Total						**14,000**

7.10 Implementation Schedule

An implementation schedule gives a clear-cut direction on the timeline for the implementation of stipulated mitigation measures. It is anticipated that each of the stated measures should be time-based for suitable implementation and appropriate monitoring. Table 7.2 documents the schedule for the mitigation measures with respective time lapse.

Table 7.4: ESMP Implementation Schedule

S/N	Mitigation measures for:	Mitigation Timeline (Monthly)																							
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	16th	17th	18th	19th	20th	21th	22th	23th	24th
1.	Agricultural Productivity																								
2.	Agro-Processing																								
3.	Small Infrastructure																								

7.10 ESMP Costing and Cost Analysis

The cost analysis illustrated here is structured to ensure that each of the identified mitigation measures is successfully and expertly implemented. It is designed exclusively for each of the activities identified for each of the activities and value chains in the Kano APPEALS intervention project. Hence, it covers the Agricultural productivity, Agro-Processing and Small infrastructure activities mitigation measures. In addition, the cost is designed for a global spread across the stated measures. Table 7.3 illustrates the synoptic details of the ESMP costing for the Kano APPEALS intervention project with estimation in U.S. Dollar.

Table 7.5: Cost Analysis of the Proposed Project ESMP Implementation

S/N	ESMP Activities (Monitoring)	Cost Estimate ($)
1	**Rice**	**19,000**
2	**Wheat**	**18,300**
3	**Tomato**	**17,500**
	Total for Impact Mitigation Monitoring	**54,800**
4	***Institutional Capacity Reinforcement Programme***	
	Kano APPEALS SCO Capacity Reinforcement	5,400
	Trainings for Farmer Cooperatives	7,600
	Total for Institutional Capacity	**13,000**
Total for Mitigation Monitoring		**67,800**
	10% Contingency	6,780
Grand Total		**74,580**

7.11 ESIA Disclosures

After a review and clearance by the World Bank, the ESIA will be disclosed at the FMEnv, SME and the host LGA offices as well as at the World Bank website. The purpose of these disclosures will be to inform stakeholders about the project activities, impacts, anticipated and proposed environmental management actions as well as to obtain the certificate of conformity from the Federal Ministry of Environment.

CHAPTER EIGHT

CONCLUSION

The purpose of the Environmental and Social Impact Assessment (ESIA) study is to identify and address possible direct, indirect and cumulative significant adverse environmental and social impacts that are likely to arise from the proposed project for acceptability and sustainability. The primary objective of the ESIA is to facilitate effective decision-making and to ensure that the implementation processes during the execution of the proposed project activities are sustainable.

It is in line with the afore mentioned purpose, that this ESIA for the proposed Kano APPEALS Project (with reference to the priority value chains of rice, wheat and tomato) was undertaken to provide detailed information for decision-making to contribute to environmentally sound and sustainable development. in concordance with the Environmental Impact Assessment Decree (Decree No. 86 of 1992) and World Bank requirements.

The overall ESIA process comprised a number of key steps, with the methodologies to achieve them. The steps include:

- screening and scoping
- baseline data collection
- stakeholder consultations
- impact assessment
- management plans
- reporting and disclosures

The ESIA gave the rationale, purpose, objectives and general methodologies for the assessments. It has also outlined the policy, administrative and institutional frameworks. The location, activities, stakeholder engagement process and analysis of the project alternatives were also enshrined in the report. Baseline environmental and social conditions and their potential receptors, such as the climate, geology, water, air, soil, biological, health and socioeconomic environments were also depicted, using the data obtained from both literature and field surveys. Potential environmental and social impacts were identified and measures for their mitigations were proffered in the report. Environmental and social management plan, monitoring, GRM, GBV and labour influx issues associated with the proposed project activities of Kano APPEALS were also addressed in the report.

The positive impacts identified include improvement on communication, access to markets, improvement of commercial exchanges, access to education and health centres, exposure to modern farming techniques, employment generation and overall improvement of local and national economy. The impacts to the national economy and local employment were assessed to be of major significance post-mitigation. The positive impacts of the Project on employment and economy are considered to remain as major significance with enhancement

measures. Positive impacts on infrastructure were also considered to be moderate positive during operation.

The identified adverse impacts of the proposed project include; air pollution, soil, sediment, groundwater and surface water contamination from accidental/ routine discharges of effluent, workplace accidents, improper waste management has been identified. Consequently, cost-effective mitigation/ amelioration measures have been designed to ensure that these impacts are prevented, reduced or controlled to as low as reasonably practicable in order to ensure conservation of biodiversity in the area and enhance continuous compliance with environmental standards and requirements in Nigeria. It is understood that the project will result in substantial social and economic benefit for Nigeria. The ESMP developed would ensure the plans and procedures for managing the significant impacts of the project are maintained throughout the project implementation. It should be stressed here that holistic and religious implementation of the mitigation measure; and monitoring, the negative impacts would be avoided or reduced to the acceptable limit, to ensure the sustainability of the project objectives.

It could therefore be finally concluded that, from the outcomes of the ESIA undertaken, all the environmental and social issues identified can be mitigated and managed through the ESMP presented in the report. Therefore, we recommend that the ESIA of Kano APPEALS Project be approved and issued ESIA permit. The mitigation measures that have been proffered shall be adequately implemented in accordance with the ESMP and in compliance with the ESIA Act and the World Bank environmental and social safeguard policies

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Annexes

Annex I: Sample of Socioeconomic Questionnaire and Checklist
Environmental and Social Impact Assessment (ESIA) for the APPEALS project proposed activities along priority Value Chains in Kano State
Questionnaire

Agro-processing, Productivity Enhancement and Livelihood Support Improvement (APPEALS) Project is a World Bank assisted project prepared by Federal Ministry of Agriculture and Rural Development aiming at transitioning of small and medium farmers' production system to market oriented agriculture. Part of the mandate of the project is to undertake Environmental and Social Impact Assessment (ESIA) for the project proposed activities along priority Value Chains in Kano State. It is in line with this that the consultant to undertake the ESIA seeks information from you and assuring you of confidentiality.

Section A: BASELINE

1. LGA	
2. Community	
3. GPS location	N E
4. Name of Respondent	
5. Sex of the Respondent	Male () Female ( )
6. Age of Respondent (in years)	
7. Marital status of respondent	Married ( ) Single ( ) Divorced ( ) Widowed ( ) Others _____
8. Phone Number	
9. Level of education	None ( ) Primary school ( ) Secondary school ( ) Tertiary ( ) Adult Education ( ) Quranic Education ( )
10. Membership of cooperative	Yes ( ) No ( )
11. Source of Income	Crop production ( ) Animal production ( ) Trading ( ) Civil service ( ) Others (specify).....
12. Household size	_____
13. What are their source(s) of income?	Crop production ( ) Animal production ( ) Trading ( ) Civil service ( ) Others (specify).....
14. What crops do you produce among these:	Rice ( ) Tomato ( ) Wheat ( )
15. Are you aware of any existing agricultural project in this area?	Yes ( ) No ( )
16. If yes, name them	a..... b..... c..... d.....
17. Do you have any	Rice ( ) Tomato ( ) Wheat ( )

processing plant for these commodities in this community?	

Section B: Accessibility

18. How is this community accessible?	Feeder Road ( ) Tarred Road ( ) Footpath ( ) Others(specify).....
19. Do you have public Transport in the community?	Yes ( ) No ( )
20. Do you have private vehicles in this community?	Yes ( ) No ( )

Section C: Education

21. Which school do you have in this community?	Islamiyya ( ) Qur'anic ( ) Primary/basic ( ) Senior secondary ( ) Tertiary ( ) None ( )
22. How would you rate school enrolment among children in this area?	..... %
23. How would you rate school dropouts among children in this area?	..... %

Section D: Health

24. Which health facility is available in this area?	Cottage Clinic ( ) PHC Clinic ( ) Private Clinic ( ) Nursing Home ( ) Chemist ( ) Others(specify).....
25. How many of these health facilities each are available in this area?	Cottage Clinic ( ) PHC Clinic ( ) Private Clinic ( ) Nursing Home ( ) Chemist ( ) Others(specify).....
26. Do you have a Sporting place?	Yes ( ) No ( )
27. Which diseases are present in this community?	Malaria ( ) Typhoid ( ) Dysentery ( ) TB ( ) Ulcer ( ) STI's/ HIV ( ) Corona Virus ( )

Section E: Community Issue

28. Do you have communication Gadgets?	Yes ( ) No ( )
29. Which sites are peculiar as landmarks in this community?	River ( ) Dam ( ) Mountains ( ) Vegetation ( ) Others(specify).....
30. Do you have Cultural gatherings in a year?	Yes ( ) No ( )
31. If yes which are they?	....

Section F: Housing

32. What type of house do you have?	Mud ( ) Thatched ( ) Concrete/block ( )
33. What is the Nature of the Tenure?	Personal ( ) Renting/hire ( ) Free-rent ( )
34. Is renting house affordable in	Yes ( ) No ( )

the community?	
35. Do you have any guest house in this community?	Yes ( ) No ( )
36. If yes is it affordable	Yes ( ) No ( )
37. Do you have any of these Facilities Playground Viewing Centre Town Hall Communication Gadgets Police Post	Yes No ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )

38. How do you rate the quality of the following materials in your area?	Good	Moderate	Low
Water			
Soil			
Air			
Noise			
Resonance			
Storms			

Section G: Gender Based Violence

39. How would you rate the prevalence of the following GBVs?

GBV/SEA	Low	Minor	Moderate	High
Rape				
Forced Prostitution				
Sexual Abuse				
Sexual Harassment				
Women Trafficking				

40. Which agency do you report GBV?	Police ( )	Court ( )	Community Leaders ( )	Civil defense ( )	Hisba ( )	NGO ( )

41. Are you satisfied with the way and manner the GBV issues are handled?	Yes ( ) No ( )

42. How would you channel any complain as a result of any project implements?	Traditional rulers ( )	Farmer groupleaders ( )	Police ( )

Section H: Social Vices

43.Do you experience any of the Following Vices?	Yes	No

Drug Abuse	( )	( )
Human Trafficking	( )	( )
Bisexualism	( )	( )
Rape	( )	( )
Theft/burglary	( )	( )

Section I: Labour Influx

44. Do you have enough labour supply for construction?	Yes ( )	No ( )
45. Do you employ children for labour supply?	Yes ( )	No ( )
46. Do you think labour influx would bring commodity price hike?	Yes ( )	No ( )
47. Do you experience road traffic in this community?	Yes ( )	No ( )
48. Do you have accidents on the roads?	Yes ( )	No ( )
49. Do you have enough waste disposal sites?	Yes ( )	No ( )
50. Do you have adequate wastewater discharge system?	Yes ( )	No ( )

51. How would you rate the occurrences of these factors if road or processing plant projects are sited in your area ?

Factor	Low (1)	Minor(2)	Moderate(3)	Major(4)
Reduction in vegetation				
Reduction in sizes of farmlands				
Flooding				
Erosion				
Air pollution				
Water pollution				
Soil degradation				
Resettlement				
Others .				

52. How do you rate the benefits of these factors when road or processing plant project are sited in your area ?

Factor	Low	Minor	Moderate	Major
Provision of employment				
Increase in output				
Increase in profit level				
Improvement in nutrition				
Increase in income				
Reduction in crimes				
Others ..				

Section J: Awareness of APPEALS

54. If yes how did you get the awareness

53. Are you aware of APPEALS project?	Yes ( ) No ( )

Extension workers ( )	Radio ( )	Television ( )	Sensitization by APPEALS ( )	Farmer associations ( )	Farmer field days ( )	Others(specify) ....

Section K: SWOT Analysis in relation to APPEALS project

What are the strengths, weaknesses, opportunities, and threats your community has in relation to the APPEALS Project and its related activities?

55. Strengths (*(Strengths are the positive internal aspects that the structure in question controls, and on which we can build in the future.).*

Strengths	**Tick as appropriate**
Availability of Labour	
Adequate farming skills	
Availability of input markets	
Availability of output markets	
Unity and cohesion among community members	
Good leadership	
Availability of rental accommodation	
Good road network	
Others	

56. Weaknesses (*In contrast to strengths, weaknesses are negative internal aspects, but which are also controlled by the organization and for which there is significant room for improvement.)*

Weaknesses	**Tick as appropriate**
Drug abuse by youths	
Inadequate health facilities	
Incessant road accidents	
Frequent report of GBV cases	
Others (mention)	

57. Opportunities (*Opportunities are positive external possibilities, which may be exploited, in the context of current strengths and weaknesses. They develop outside the scope of influence of the structure or at the margin)*

Opportunities	**Tick as appropriate**
Availability of processing plants in the community	
Availability of manure from farm wastes	
Provision of employment	
Transportation	

Others	

58. Threats (*Threats are external problems, obstacles or limitations that may prevent or limit the development of the structure. They are often outside the sphere of influennce of the system)*

Threats	**Tick as appropriate**
Erosion in farmlands	
Flooding	
Theft of farm produce	
Infestation by birds and insects	
External pastoralists	
Late supply of inputs by the government	
Erratic supply of electricity	
Limited supply of pipe borne water	
Others	

Thank you

Environmental and Social Impact Assessment (ESIA) for the APPEALS project proposed activities along priority Value Chains in Kano State

Agro-processing, Productivity Enhancement and Livelihood Support Improvement (APPEALS) Project is a World Bank assisted project prepared by Federal Ministry of Agriculture and Rural Development aiming at transitioning of small and medium farmers' production system to market oriented agriculture. Part of the mandate of the project is to undertake Environmental and Social Impact Assessment (ESIA) for the project proposed activities along priority Value Chains in Kano State. It is in line with this that the consultant to undertake the ESIA seeks to interact with the members of this community. Thank you.

Section A: General Information

1. Town/Village/Community: ……
2. LGA: …….
3. State: ……
4. GPS Ordinates……

Section B: Community profiling

5. What is the nature of the community demographics? (population and its distribution by age, gender, availability of labour, influx of seasonal labourers for farm and other activities, child labour etc)
6. How is the community structured? (Institutions, hierarchy socio-economic status, ways of life etc)
7. How are roles and responsibilities distributed and defined by gender, age, status? (productive, communal, and reproductive roles…)
8. What are the major tribes or ethnic groups in the community?
9. What are the main occupations in the community?
10. What are the different projects implemented or being implemented in the community?
11. How were you involved in the implementation?
12. What are your experiences in the activities and outcomes of these projects?

Section C: Baseline conditions, environmental and social impacts

13. What is the level of your internal cohesion and organisation?
14. Have you experienced conflict (e.g. resource based such as farmer-pastoralists) in the community?
15. Do you possess mechanisms for addressing grievances (internal and external) in the community?
16. How effective were such mechanisms in the past?
17. What is your level of participation in different development and political decisions affecting your community?
18. How can you rate your environment in terms of the following?

- the quality of the air and water people use …….....
- the availability and quality of the food they eat…….....…..
- the level of hazard or risk, dust and noise they are exposed to……
- the adequacy of sanitation…….....
- their physical safety …….....

- their access to and control over resources…….....……

19. How can you describe the status of your community in terms of the following?
    - Child labour…….....……
    - School enrolment
    - School dropouts
    - Gender based violence
    - Drug abuse
    - Child abuse
    - Sexual Abuse
    - Crimes
20. Did you perceive risks of increased social vices in your community in the future? If yes Explain
21. Did you perceive risks of social conflict in your community in the future? If yes Explain
22. Did your community have traditional mechanism for addressing gender-based violence? If yes describe.
23. If no, how did you report and address gender-based violence in the community.?
24. Are you aware of government agencies and or other organisations responsible for addressing gender-based violence? If yes, give details of each (name, location, type, accessibility etc)
25. If you have a complain arising from the project implementation, how would you channel it?
26. Are you aware of government agencies and or other organisations responsible for addressing your grievances? If yes, give details of each (name, location, type, accessibility etc)
27. What difficulties do you perceive in channelling your complains?
28. Are you satisfied with the way and manner the service providers handle your grievances?
29. If no, how do you want them to improve?
30. Do you have access to markets for inputs, outputs, and services?
31. What are different challenges you experienced in accessing
    a. Input markets including machineries for post-harvest and processing
    b. Output markets
    c. Extension and advisory services

32. What are the major occupations (income generating activities) people are engaged?
    …….....
    …….....……
33. How can you rate your performance in terms of productivity and profitability in the various economic activities you are engaged? (Especially in the following value chains:
    - Tomato Value Chain

- Wheat Value chain
- Rice Value Chain
- Other (Specify…….)

34. Do you have adequate and systematic access to health services in the community?
35. How many health facilities do you have in the community?
36. What important heath related challenges do you usually face? (e.g. most common diseases, risks of diseases due to economic activities,)
37. Did you perceive any risks of disease outbreak or aggravation due to ongoing or likely economic activities or project in the future? If yes, explain.
38. Do you think arrival of large number of project workers would have any impact on your community in terms of accommodation, traffic, water supply, sanitation, and other facilities?
39. What social and economic opportunities do you expect to have if a camp is provided for the workers?

Section D: The APPEALS project and community participation

40. Are you aware of the APPEALS Project and its different sub-components? (*the project details will be explained to the participants including the expectations and consequences*)
41. What categories including gender and institutions will affect or be affected by the APPEALs project implementation in the community?
42. In what ways do you think the APPEALS project will affect you positively? (social, economic, institutional, environmental etc)
43. In what ways do you think the APPEALS project will affect you negatively? (social, economic, institutional, environmental etc)
44. Are you willing to accept the negative impacts of the project and its related activities?
45. What mitigation measures will you recommend in minimizing the expected negative impacts of the project? And how will you be involved in implementing such measures?

Section E: SWOT Analysis in relation to APPEALS project

46. What are the strengths, weakness, opportunities, and threats as a community in relation to the APPEALS Project and its related activities?

a. Strengths (*(Strengths are the positive internal aspects that the structure in question controls, and on which we can build in the future.).*

……
……...

b. Weakness (*In contrast to strengths, weaknesses are negative internal aspects, but which are also controlled by the organization and for which there is significant room for improvement.)*

……
……

c. Opportunities (*Opportunities are positive external possibilities, which may be exploited, in the context of current strengths and weaknesses. They develop outside the scope of influence of the structure or at the margin)*

.....

d. Threats (*Threats are external problems, obstacles or limitations that may prevent or limit the development of the structure. They are often outside the sphere of influence of the system)*

Annex II: Consultations with Stakeholders

Stakeholders Consultations

During the conduct of the ESIA, public consultations were carried out with respective beneficiary/farming communities and other stakeholders. The meetings were conducted with community members (including women and youths representatives), staff of NESREA, Kano State Ministries of Agriculture and Natural Resources, Women Affairs, Environment; staff of APPEALS project; and Non-governmental Organisations. The purpose of consultations was: (i) to generate a good understanding of the project by all stakeholders; (ii) to enhance ownership of the project by local leadership, the community and local farmers; (iii) to understand people's expectations about the project; (iv) to understand and characterize potential environmental, social and economic impacts of the project; (v) to enhance local benefits that may accrue from the project; and (vi) to enable stakeholders involved in the project to provide views, hence participating in or refining project designs. In addition, site specific investigations were also conducted to gain insight to the likely impacts of the project activities on the environment. The issue of Gender Based Violence (GBV) as cross cutting was also discussed at the community level and with stakeholders directly involved to obtain a broad picture. The views and comments of the public have been incorporated to the extent possible and are likely to influence the design as well as the locations of the proposed projects and infrastructure development. The following results of consultations are presented below:

Consultations with community members

In all the communities consulted (see Annex 1), the estimated age distribution during the FGDs indicated that majority of the people (over 60%) were in the active age categories and can therefore participate productively in any economic and development activities. In terms of population distribution, the results indicated the dominance of females with most communities reporting about 60% to 40% as females to males ratio. Despite the large proportion of women and youths, their involvement in economic activities and decision making is inadequate. There are about 2% of the community members who are people living with disabilities, most of whom do not have any reliable source of livelihood.

In terms of engagement in economic activities and occupations, majority of the people in the rural communities are crop farmers (80%) with sorghum, millet, rice, maize, tomato, onion and wheat as the major crops produced. Other economic activities mentioned include; livestock rearing, agro-processing and marketing, petty trading and provision of farm labour. In the urban communities, majority of the people are traders, followed by food processing, agro-processing and skilled work.

During the consultations environmental issues were discussed of which the general assessments indicated good condition in terms of sanitation, air and water quality in all the rural communities interviewed. In the urban communities people generally complained about poor state of sanitation and poor quality of air and water due to pollution caused by industrial, traffic and other human activities.

Social issues such as Gender Based Violence (GBV) and conflicts were also discussed. In the rural communities, the incidence of gender based violence is not common. In the urban communities, GBV issues used to arise in few occasions and are usually addressed using the traditional and formal hierarchy. Most of the community members attributed the less prevalence of GBV cases due to their diligence in general family counseling, reduction in hawking by children, avoidance of allowing minors to wander around at odd periods of the day (especially early, middle and late hours of the day), increased school enrolment and provision of local vigilante groups for surveillance.

The occurrence of resource conflicts especially between farmers and pastoralists during the rainy and dry seasons were discussed in some of the rural communities interviewed. Such conflicts (crop damages) when they occur are settled amicably without violence through the traditional leaders and compensations are usually paid to the party affected.

In terms of formal education, school enrolment reaches up to 80% with a school dropout level of 10% especially in rural areas. There are public basic and secondary schools in all the communities interacted with. In the urban centres, there are many private schools. Interestingly, there are some tertiary institutions and vocational centres located in some rural communities like Rano, Kura, Bichi and Dawakin Tofa, though, majority of the institutions are situated in the urban centres.

The health conditions and status of the people in the communities consulted were generally good. The available health facilities in the rural communities usually include Local Primary Health Care Units, dispensaries and Private Patent Medicine Stores. Major diseases commonly occurring in the communities were generally, Malaria Fever, Typhoid Fever, Ulcer and some Urinary Tract infections. The people are also aware about other diseases such as HIV/AIDS, Avian Influenza and COVID-19.

Majority of the community members were aware of the Agro-Processing, Productivity Enhancement and Livelihood Improvement Support Project (APPEALS) and its activities. The people consulted in the communities generally have positive opinion and expectations of the APPEALS project. They believe that the project would affect them positively by improving and increasing their farm outputs, incomes, access to technologies, inputs and improved skills.

The communities have prior experiences with other projects such as Agricultural Transformation Agenda Support Program (ATASP) (where a modern market infrastructure was built), Anchor Borrower, ICRISAT, WACOT (supply of pesticides, sprayers and out-grower support) and SASAKAWA (technology for maize production).

Consultations with staff of Ministry of Agriculture and Natural Resources/ APPEALS

The staff of MANR and APPEALS were consulted. They indicated their resolve to undertake the project components to the best they could. Most of them have the requisite trainings on

similar projects in the State. They also assisted in providing information relevant to the ESIA study; and have assisted in the stakeholder engagements.

Consultations with NESREA staff

The NESREA is a Federal Agency under the Federal Ministry of Environment, established by its establishment Act in 2007 and saddled by law to regulate and enforce environmental laws. According to the staff (led by Engineer Sahalu Ubale, 08036074453), the key elements of the agency's enforcement strategies include: inspection, compliance monitoring, negotiation, legal action and prosecution.

The methods of enforcement include: issuance of permit, prohibition and enforcement notices; variations of license conditions, implementing the 'polluter pays' principles, suspension and revocation of permits and licenses; and injunctions to carryout remedial works. The staff undertake in-situ assessment of the level of pollutions by the industries, including agro-processing plants and any site where pollutants in gaseous, liquid and solid forms are released.

Consultations with the staff of Kano State Ministry of Women Affairs

The staff of the KSMOWA, who serve at the *WARAKA* centre, which is the only Sexual Assault Referral Centre (SARC) in the State, situated at Murtala Mohammed Specialist Hospital, Kano were consulted. According to the Counseling Officer, who is a lady (Halima BB Faruk, 08065762620), the centre is jointly manned by Medical Doctors from the State's Ministry of Health; Lawyers from Ministry of Justice, Counselors from Ministry of Women Affairs, Non- Governmental Organisations and the Police. Those staff handle any case of Gender Based Violence brought to the centre and offer services such as medical treatment, forensic and legal. The Counseling Unit offers other services such as referral to ACT Unit of the hospital if the survivor is infected with HIV/AIDS, liaising with NAPTIP and if the survivor needs temporary accommodation, they provide lodge at the State VVF hostel. The centre also empowers less privileged survivors. The Counseling Officer revealed that one (1) out of four (4) girls; and one (1) out of ten (10) boys are sexually abused. She also reported that about 60 cases of GBV are presented to the centre monthly, most of which are brought from the Metropolitan Local Government Areas. Most of the survivors are minors including girls and boys. She also attributed the rise in GBV cases to the hike in unemployment and drug abuse among the youths. The staff expressed concern over the inadequacy of the facilities and manpower in the centre. Also, some of the survivors are from poor families, that could not afford even transport fares to-and fro the centre. The centre has to provide for those immediate needs of those survivors.

Consultations with the staff of Kano State Ministry of Environment

The staff of the Ministry of Environment were consulted (lead by Muhammad Auwal, 08036383760)and they expressed dismay over the incessant deforestation of the reserved forests and the communal forest areas in the State. Records show that out of twelve (12) forest reserves in the State, one (8.33%) was converted to farmlands, five (42%) were dereserved, four (33%) were encroached, one (8.33%) was converted to a dam and one

(8.33%) was converted to a game reserve. Also, almost all the communal forest areas in the State have been encroached. They also reported that most of the indigenous trees are being wasted with little replacements.

Consultations with the Non-Governmental Organisations (NGOs)

There are several non-governmental organisations in Kano that aim at protecting the rights of the less privileged in the society. The NGOs target less privileged, children and orphans. The consultations were carried out with the Chairmen of the Human Rights Foundation of Nigeria (HURFON, 08090979949) and Human Rights Network (HRN). Both organisations reported that they receive GBV cases from parents, traditional rulers, especially if the survivor is less privileged. They have the license under the law to follow up any GBV case reported to them, which requires their interventions. they struggle to see that justice is meted to the parties, both accused and the victim. They liaise with other government agencies like NAPTIP, FIDA and the SARC Centre. They ensure that culprits are apprehended by the police and arraigned before the court. They also appear in courts of law where such cases are heard.

General Observations from the Consultations

- There is relative paucity of engagements of women, youths and people living with disabilities in the decision making and economic activities in the communities.
- There is prevalence of gender based violence cases especially in the urban centres which are not disclosed by the community members. This is evident because most of the communities consulted reported that there was no case of GBV, but the *Waraka* centre reports disagree with this, as about 60 cases are reported every month.
- Forest resources, especially local tree species are facing extinction.

Annex III: Lists of Community members consulted (FGD)

Annex i: Lists of Community members consulted (FGD)

1. Dan Hassan Community, Kura LGA

S/N	NAMES	PHONE NO.
1	Dahiru Inuwa	08135053822
2	Muhammadu Arabu	07035234972
3	Baffa Ibrahim	08084221580
4	Awaisu Sulaiman	07037095045
5	Lawan Abubakar	07060996825
6	Najibu Garba	08065089146
7	Usaini Shehu	08028013814
8	Isyaku Yahaya	08038090004
9	Ali Amadu	
10	Hassan Haruna	07033737279
11	Rabiu Sani	08030670437
12	Shamsudden Alasan	07064640955
13	Bello Kawu Dan-hassan	08038552146
14	Hamisu Yahaya	07033578076
15	Mahmud Sabiu	07033740724
16	Abubakar Tijjani	09072738035
17	Bara'u Ibrahim Umar	08107071309
18	Nafi Baffa	07042067578
19	Hassana Najib	08063773704
20	Yahaya Musa	08037051488
21	Ananinya Mudi	
22	Balaraba Yahaya	
23	Safiya Lawan	
24	Ahmad Mohd	07089826299
25	Abdullahi Aliyu	07069202526

2. Bunkure (Bunkure LGA)

S/N	NAMES	PHONE NUMBERS
1.	Sunusi Abdullahi	08167885429
2.	Yuusuf Yahuza B	08060394069
3.	Mustapha Umar	07019482443
4.	Ali Yakubu	08063608215
5.	Shuaibu S Fawa	08066472217
6.	Umar Abdu	08101905882
7.	Abdulhadi Yahuza	07068868907

3. Rurum, Rano LGA

S/N	NAMES	PHONE NO.
1.	Alh. Auwalu Me Gida	08066009534
2.	Umar Abdullahi	08062485183
3.	Muhammad H Idris	07066215988
4.	Alasan Tata	08066515823
5.	Dahiru Sani	08140199374
6.	Anas Tasiu Abdulaziz	08038531145
7.	Abdulbasi Auwalu	07060502178
8.	Suraja Inuwa	08060700362
9.	Alh. Dan Iro Mohd	08032313491
10.	Bello Idris	08108939787
11.	Yusufu Adamu	08169803743
12.	Tasiu Abdulaziz	08067241426
13.	Buhari Tasiu	08034994637
14.	Hajiya Kyauta	09067882270
15.	Hasiya Yusif	07066303959
16.	Ramatu Yusif	
17.	Hahmatu Ibrahim	
18.	Musa M. Bello	08035904581
19.	Yau Garba	08032210849

4. Jobe, DawakinTofa, LGA

S/N	NAMES	PHONE NO.
1.	Halliru Muhammad	08149022914
2.	Musbahu Bala	
3.	Arma Umar	07035736664
4.	Tsalha Umar	07016807344
5.	Surajo Yahaya	07085062471
6.	Mas'udu Muhammad	08143852606
7.	Inusa Muhammad Nasir	08133782267
8.	Yushau Muhammad	07001888838
9.	Salisu Shuaibu	08120946159
10.	Bala Dan Hajiya	08024322057
11.	Baffale Liti	08081081166
12.	Habibu Abdullahi	08149187177
13.	Yushau Yusufa	08029145079
14.	Ali Dahiru	09028044504
15.	Auwal Abdulaziz	08111811751
16.	Yahuza Alhaji Hamisu	08064236786
17.	Muntari Yau	08101986999
18.	Rabi Yushau	08025265177

19.	Bara'atu Habibu	08149187177
20.	BintaTsalha	07016807344
21.	Hamisu Ahmad Bichi	08066050635
22.	Umar Abdullahi	08065529397
23.	Ashiru Jafaru	

5. Kiyawa, Bagwai LGA

S/N	NAMES	PHONE NO.
1.	Salisu Abdu Yahaya	08022627585
2.	Dan Wallo Yusif	07085731478
3.	Salisu Musa Baba	08082810070
4.	Ahamed Iliyasu	07082178815
5.	Shuaibu Waziri	07083041737
6.	Aminu Sani	07084196685
7.	Jazuli Miko	07085611650
8.	Muhammed Yusif	08021982848
9.	Garba Alkasim	08082494907
10.	Uballe Sani	08068253768
11.	Nasiru Musa	07060614470
12.	Sama'ila Bello	08121174767
13.	Nura Tukur Baure	08026543836
14.	Idris Sabiu	08080962220
15.	Nana Fiddausi Salisu	09077648420
16.	Dahiru Isyaku	07019170441
17.	Haruna Sabiu	08087412066
18.	Almu Umar	09048478248
19.	Rafi'atu Salisu	07087333666

6. Shanono, Shanono LGA

S/N	NAMES	PHONE NO.
1.	Mukhtar Inuwa Abubakar	08137839542
2.	Auwalu Saleh Mohd	08135053131
3.	Kabiru Salisu Shanono	08029079323
4.	Aminu Ahmad	08103557186
5.	Rabiu Bello	09065193190
6.	Aminu Mustapha	08039120969
7.	Kamal Musa Abubakar	08022284069
8.	Abdulmumini Galadima	08032356614
9.	Abdulaziz Ahmad	08035184611
10.	Adamu Magaji	07063059418
11.	Uwade Muhammad	08124579955
12.	Marka Wakili	07069531469

13.	Magajiya Ali	08023175306

7. RijiyaBiyu, Dala LGA

S/N	NAME	PHONE NO.
1.	Salihu Abubakar Maje	07073774400
2.	Muhammad Dalha	08134563456
3.	Umar Badamasi	08067374712
4.	Alhaji Naziru	08074096330
5.	Hamisu Saleh	07069000245
6.	Jamilu Ibrahim	07030469492
7.	Gali Shehu	
8.	Alhaji Danlami	08039198595
9.	Balarabe Dogo	
10.	Kabiru Yahaya	08079539497
11.	Jamilu Lawan	09064051320
12.	Hadiyatullahi Hamisu	08027277217
13.	Binta Ahmad	07060930342
14.	Ladidi Bala	07060930342
15.	Ummi Nuhu	08090516996
16.	Hauwa Ibrahim	
17.	Asabe Ahmad	07033693049
18.	Hauwa Yau	08149589913
19.	Maryam Abdullahi	07089434293
20.	Lami Ahmad	08165226106
21.	Furaira A Auwal (Alkaki)	09034129178
22.	Balaraba Ahmad	09030010129

8. RijiyarZaki, Ungoggo LGA

S/N	NAME	PHONE NO.
1.	Abubakar Musa Danladi	07018707112
2.	Mahmud Musa Danladi	07065506069
3.	Hamisu Abdullahi	08068818580
4.	Umar Auwalu Danladi	08067397845
5.	Ibrahim Adamu Kawu	07034317461
6.	Adamu Abdullahi	08059712921
7.	Yahaya Ashiru	08086493320
8.	Abubakar Dahiru	08061223766
9.	Sani Shehu	08132033306
10.	Zaharaddini Auwalu	08069284507
11.	Inusa Musa	07062746938
12.	Mahmud Hamza	09077267567
13.	Umar Idris	

14.	Saleh Muhd	07068776886
15.	Zangina Abdullahi	08184006149
16.	Sani Musa	07081003462
17.	Zangina Auwalu	07065343252
18.	DahiruMuhd	08136333136
19.	Amadu Isyaku	
20.	Auwalu Danladi	08037159455
21.	Saminu Abdullahi	07036952877
22.	Liti Shehu	08089977778
23.	Lawan Tsoho	
24.	Harisu Muhammad	07036833717
25.	Rabiu Uba	07039090320
26.	Jibrin Musa	07037740700
27.	Bala Shehu	08140408881

Annex IV: Summary of World Bank Environmental and Social Safeguards

- **ESS1 Assessment and Management of Environmental and Social Risks and Impacts** sets out the Borrower's responsibilities for assessing, managing and monitoring environmental and social risks and impacts associated with each stage of a project supported by the Bank through Investment Project Financing (IPF), in order to achieve environmental and social outcomes consistent with the Environmental and Social Standards (ESSs).

- **ESS2 Labor and Working Conditions** recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth. Borrowers can promote sound worker-management relationships and enhance the development benefits of a project by treating workers in the project fairly and providing safe and healthy working conditions.

- **ESS3 Resource Efficiency and Pollution Prevention and Management** recognizes that economic activity and urbanization often generate pollution to air, water, and land, and consume finite resources that may threaten people, ecosystem services and the environment at the local, regional, and global levels. This ESS sets out the requirements to address resource efficiency and pollution prevention and management throughout the project life-cycle.

- **ESS4: Community Health and Safety** addresses the health, safety, and security risks and impacts on project-affected communities and the corresponding responsibility of Borrowers to avoid or minimize such risks and impacts, with particular attention to people who, because of their particular circumstances, may be vulnerable.

- **ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement** - involuntary resettlement should be avoided. Where involuntary resettlement is unavoidable, it will be minimized and appropriate measures to mitigate adverse impacts on displaced persons (and on host communities receiving displaced persons) will be carefully planned and implemented.

- **ESS7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities** ensures that the development process fosters full respect for the human rights, dignity, aspirations, identity, culture, and natural resource-based livelihoods of Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities. ESS7 is also meant to avoid adverse impacts of projects on Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities, or when avoidance is not possible, to minimize, mitigate and/or compensate for such impacts.

- **ESS8: Cultural Heritage** recognizes that cultural heritage provides continuity in tangible and intangible forms between the past, present and future. ESS8 sets out measures designed to protect cultural heritage throughout the project life-cycle.

- **ESS9: Financial Intermediaries** (FIs) recognizes that strong domestic capital and financial markets and access to finance are important for economic development, growth and poverty reduction. FIs are required to monitor and manage the environmental and social risks and impacts of their portfolio and FI subprojects, and monitor portfolio risk, as appropriate to the nature of intermediated financing. The way in which the FI will manage its portfolio will take various forms, depending on a number of considerations, including the capacity of the FI and the nature and scope of the funding to be provided by the FI.

- **ESS10: Stakeholder Engagement and Information Disclosure** recognizes the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice. Effective stakeholder engagement can improve the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and implementation.

Annex V: Monitoring Costs for Significant Potential Adverse Impacts of construction and maintenance of farm access roads and small dams; Rice, Wheat and Tomato

Monitoring cost for Significant Potential Adverse Impacts of construction and maintenance of farm access roads and small dams

	Activities	Environmental and social impact	Key Receptors	Mitigation measures	Monitoring	Responsibility	Monitoring cost (USD)
1.	The potential air quality and noise impact will include						
		➢ Increase in noise and dust due to vehicles movement and construction activities ➢ Gaseous emissions from vehicles plying the roads. ➢ Health and safety issues of both the workers, residents and the road users due to vehicular speed and introduction of harmful gases	Flora, fauna, soil	➢ Speed breaks should be introduced at specific points. ➢ Trees should be planted within few metres distance between road and residential areas to reduce noise. ➢ Sprinkle water during construction. ➢ Road signs indicating the speed limit should be erected at sections of the road. ➢ The use of rickety vehicles should not be allowed	➢ Regular check for adherence to safety concerns. ➢ Ensure that all areas have trees planted along the road corridors. ➢ Ensure that road signs are placed along the road corridors. ➢ Ensure that speed limits are strictly adhered to. ➢ Ensure that vehicles are in good condition so as not to pollute the environment when driving along the roads.	Contractor, ESS, RIE, CBDO, COO, CIGs	1,400.00

2.	Water quality impact will include						
		➢ Oil and grease droplets might pollute surface and groundwater. ➢ Effluent generated from mixture of water with chemical lubricants might contain COD and SS which will impact adversely on the water quality of the area. ➢ Solid wastes generated and dumped around the area may sip and contaminate the groundwater.	Soil, water, workers, motorists, Public	➢ Chemical wastes from vehicles should be handled carefully and dumped properly; ➢ Motorists should be educated on the dangers of indiscriminate dumping of chemical wastes close to farmlands ➢ Motorists and road users should use approved mechanic villages for vehicular repairs. ➢ Ensure all construction equipment, machinery and vehicles are clean ➢ Ensure regular checks and maintenance of vehicles and machinery to avoid oil spills. ➢ Ensure proper waste disposal strategies.	➢ Ensure that proper waste management practices are adhered to. ➢ Adherence to the principles of safe and clean environment should be taken paramount. ➢ Road users should be made to observe the mitigation measures.	Motorist, Contractor, ESS, RIE, CBDO, COO, CIGs	1,200

3.	Ecology and biodiversity impact will include.	

		➢ Contamination of surface water and groundwater from chemical effluents. ➢ Poor and untidy environment. ➢ Risks and impairment of the ecosystem.	Surface water, groundwater, Community members	➢ Where possible, the clearing of vegetation, particularly of indigenous trees needs to be avoided as much as possible during construction, and the clearing needs to be carried out only where necessary ➢ Trees should be planted in the open farm access roads. ➢ Official waste dump sites should be established and waste management operators should be contacted on the prompt clearing of waste deposited. ➢ Where clearing is done, land should be landscaped	➢ Regular environmental assessment with interest on the ecological biodiversity. ➢ Consistent checks on the management of waste.	Contractor, ESS, RIE, CBDO, COO, CIGs	850.00

				and reclaimed by planting more trees and other forms of vegetation. ➢ Community members should be advised to use appropriate waste dump sites and to stop indiscriminate waste dumping.			
4.	Wildlife and forestry impact will include						
		➢ Migration to a new habitat where it is possible to adapt. ➢ Loss of original forest cover. ➢ Evolvement of invasive plant life. ➢ Reduction in the population of micro fauna	Flora, Fauna	➢ Massive tree planting around the area. ➢ Regular checks on the invasive plants. ➢ The community should be engaged on the need to keep to all environmental and safety regulations.	➢ Consistent checks on the adherence to safety regulations. ➢ Regular cleaning and clearing of the environment. ➢ Ensure massive tree planting.	Contractor, ESS, COO, CBDO, CIGs	750.00
5.	Socioeconomic and community health impact will include						
		➢ Exposure to danger in form of road accidents.	Workers, Farmers, neighbouring community	➢ Road signs and symbols indicating designated speed	➢ Consistent checks on the adherence to safety	Contractor, ESS, RIE,	700.00

		➢ Adverse adjustment to vehicular traffic and noise. ➢ Health implication to children from petroleum effluents. ➢ Transmission of STIs/HIV/AIDS and other communicable diseases, like Covid-19 due to free-flow and high influx of labour; *tetanus* due to cuts with metal objects particularly during the construction and operation phases. ➢ Gender Based Violence cases due to labour influx		should be erected. ➢ Introduction of speed breakers ➢ Proper cleaning and clearing of petroleum products. ➢ Sensitize workers and community members on the ways of contracting HIV/AIDS through collaboration with NGOs, CBOs available in the State. ➢ Empower the testing centres for STIs/HIV/AIDS within the health facilities in the immediate communities. ➢ Ensure that Covid-19 protocols as provided by the Presidential Tasks Force and other health agencies in the construction sites and camps. ➢ Traditional leaders	regulations. ➢ Regular check on the adherence to traffic regulations by road users.	COO, CBDO, CIGs	

				in the communities should be engaged to sensitize the workers on the values and norms of the people in the area. ➢ Contractor should provide labour influx management plan to APPEALS for approval. ➢ The community should be engaged on the need to keep to all environmental and safety regulations.			

Monitoring cost for Significant Potential Adverse Impacts for Rice Production

S/n	Activities	Environmental and social impact	Key Receptors	Mitigation measures	Monitoring	Responsibility	Monitoring Cost (USD)
1.	Pre-cropping activities	• Poor site selection (poor soil and water quality). • Interference on biodiversity conservation (changes in flora and fauna) • Deterioration from burning of biomass of cleared forest and addition of carbon into the atmosphere • Increased runoff from land	Farmers, Community members	• Selection of a good site for cropping activities • Avoid environmentally sensitive sites and unnecessary exposure to sensitive habitat • Consult Forestry Department in the selection and use of such sites	Soil and water quality tests to be compared with post cropping levels. Also, ensure trees are planted around the farms.	Farmer, ESS, PES, RIE, CBDO, Facilitator Rice, CIGs	650.00

		clearing and maximum tillage leading to soil quality and nutrient loss. • Loss of valuable natural plant species that are of medicinal value to the neighboring communities. • Removal of the topsoil from cuttings of trees and shrubs • Oil leakages from vehicles impacting surface water negatively. • Risk of work-site accidents from the improper handling of machines and equipment. • Noise and vibration. • Dust and gas emissions from the discharge of particulates that may increase respiratory diseases around the sub-project vicinity		• Avoid burning of biomass as much as possible and the use of fire only in situations where this is least environmentally damaging. • Adopt Minimum tillage practices • Create natural plant protection zone. • Ensure that the trees and shrubs are cut down only where necessary • Regular maintenance of vehicles. • Use PPE and machine manuals. • Use of noise protection devices. • Use goggles and face masks during activities			
2.	Production level	• Surface and ground water contamination through the excessive application of fertilizer. • Extreme weather conditions such as heavy rains. • Pests emergence	Surface water, groundwater, Soil, Crop	• Minimum use of fertilizer and introduction of organic fertilizers. • Adherence to Cropping calendar to suit weather. • Adhere to Integrated pest management plan.	Water quality tests, Establish cropping calendar, Provision of integrated Pest Management Plan	Farmer, ESS, PES, RIE, CBDO, Facilitator Rice, CIGs	900.00

3.	Farm operation and management	• Disposal of Agro-chemical containers • Human health deterioration through the pollution of water sources from production wastes and residues	Farmers, Public, Surface water, groundwater, Soil	• Proper disposal of Agro-chemical containers • Training on agro-chemical containers handling • Pipe-borne water should be provided in the long term to all the farmers	Trainings on disposal of agrochemical containers. Provision of Pipe-borne water	Farmer, ESS, PES, RIE, CBDO, Facilitator Rice, CIGs	650.00
4.	Harvesting and post-harvest handling	• Accidents when using machines and injuries caused by reptiles • Losses due to pest attack in the stores • Contamination of produce with foreign materials during post-harvest operations (Open drying of paddy).	Farmers, Workers, Paddy	• Use PPE during harvest and postharvest activities. • Good practices on harvest and post-harvest handling. • Use of simple machines for harvesting and post harvest handling. • Integrated Pest Management protocols should be adhered to during storage of paddy and processed rice. • Drying should be in protected, enclosed and hygienic stalls. • Mechanical dryers should be used.	Training and adoption of good practices of harvest and post-harvest handling. Innovating simple and cost effective machines like threshers for harvesting and post harvest handling. Encourage the fabrication of simple and affordable mechanical dryers.	Farmer, ESS, PES, RIE, CBDO, APS, COO, Facilitator Rice, CIGs	1,500.00
5.	Marketing	• Accidents and injuries during loading and off-loading. • Food wastes and losses during transportation. • Food wastes and losses during storage.	Marketers, Workers, transporters, Public	• Use of supporting equipment for loading and off-loading. • Ensure proper packaging during transportation. • Ensure provision of adequate storage facilities.	• Ensure that farmers and transporters Use standard packaging materials, means of transportation and storage	Farmer/ Marketer, ESS, PES, RIE, CBDO, APS, Facilitator Rice, CIGs	1,500

					facilities.		

Monitoring cost for Significant Potential Adverse Impacts for Rice Processing

S/n	Activities	Environmental and social impact	Key Receptors	Mitigation measures	Monitoring	Responsibility	Monitoring cost (USD)
	Rice Milling	• Procurement of poor-quality machines and equipment • Increase in amounts of dust and exhaust fumes from vehicle movement on the site • Generation of solid wastes such as husks. • Burning of rice husks in the milling plants • Risk of injury and accidents from operating processing machines. • Product contamination due to improper sanitation and hygiene in plant	Millers, Marketers, Public	• Ensure all procurement, construction and installation activities follow approved standard. • Use a good de-stoner machine. • Sprinkling of water to minimize dusts. • Adhere to waste management plan protocols. • Promote the use of husks for livestock feeds and other uses such as source of energy. • Use of Personal Protective Equipment including goggles and face masks during activities • Use of noise protection devices. • Use standard sanitation and hygiene protocols	• Check the environment for the status of the wastes • Monitor the use of Personal protective equipment in plant • Ensure compliance to standard protocols in the plant . • Enhance innovation of local milling equipment. • Train millers on the use of milling equipment.	Processor, ESS, APS, CBDO, RIE, WYEL, Facilitator Rice, CIGs	1,500.00
	Parboiling	• Generation of solid waste	Parboilers,	• Proper waste	• Ensure the	Processor, ESS,	1,500.00

		and wastewater. • Excessive use of firewood as source of energy. • Use of chemical detergents in parboiling. • Drying in open spaces, where people and animals trample. • Product contamination due to improper sanitation and hygiene during drying of parboiled rice.	Marketers, Public	management • Use of alternative energy sources in parboiling, such as liquefied natural gas and husks. • Sensitize processors on the adverse effects of use of detergents and other harmful chemicals during parboiling. • Use of standard drying facilities in enclosed sites. • Plant trees around the processing plant.	implementation of waste management plan • Ensure the use of proper drying facilities. • Ensure planting of trees.	APS, CBDO, RIE , WYEL, Facilitator Rice, CIGs	

Monitoring cost for Significant Potential Adverse Impacts for Wheat Production

S/N	Activities	Environmental and social impact	Key Receptors	Mitigation measures	Monitoring	Responsibility	Monitoring cost
1.	Pre-cropping activities	• Poor site selection (poor soil and water quality). • Interference on biodiversity conservation (changes in flora and fauna) • Deterioration from burning of biomass of cleared forest and addition of carbon into the atmosphere • Increased runoff from land clearing and maximum tillage leading to soil quality and nutrient loss.	Farmers, Community members, Air, Soil, flora, fauna	• Selection of a good site for cropping activities • Avoid environmentally sensitive sites and unnecessary exposure to sensitive habitat • Consult Forestry Department in the selection and use of such sites. • Avoid burning of biomass as much as possible and the use of	Soil and water quality tests to be compared with post cropping levels. Also ensure that trees are planted around the farms.	Farmer, ESS, PES, RIE, CBDO, Facilitator Wheat, CIGs	1,500.00

		• Loss of valuable natural plant species that are of medicinal value to the neighboring communities. • Removal of the topsoil from cuttings of trees and shrubs • Oil leakages from vehicles impacting on surface water negatively. • Risk of work-site accidents from the improper handling of machines and equipment. • Dust and gas emissions from the discharge of particulates that may increase respiratory diseases around the sub-project vicinity		fire only in situations where this is least environmental damaging. • Adopt Minimum tillage • Create natural plant protection zone. • Ensure that the trees and shrub are cut down only where necessary. • Plant trees around the area. • Regular maintenance of vehicles. • Use of PPE and machine manuals. • Use of noise protection equipment . • Ensure tree planting.			
2.	Production level	• Surface water contamination through the excessive application of fertilizer. • Extreme weather conditions such as heavy rains. • Pest emergence.	Surface water, underground water, Crop	• Minimum use of fertilizer and introduction of organic fertilizers. • Adherence to Cropping calendar to suit weather. • Use Integrated pest management plan.	Water quality tests Establish cropping calendar. Prepare an IPM plan	Farmer, ESS, PES, RIE, WYEL, CBDO, Facilitator Wheat, CIGs	900.00
3.	Farm operation and management	• Disposal of Agro-chemical containers. • Human health through the pollution of water sources from production wastes and residues	Soil, Surface water, Farmer, Community members	• Proper disposal of Agro-chemical containers. • Training on agro-chemical containers handling. • Pipe-borne water should	• Trainings on disposal of agrochemical containers. • Provision of Pipe-borne water	Farmer, ESS, PES, RIE, WYEL, CBDO, Facilitator Wheat,	800.00

				be provided in the long term to all the farmers.		CIGs	
4.	Harvest and post-harvest handling	• Accidents and injuries. • Food losses • Contamination of produce with foreign materials during post-harvest operations. .	Farmer, Workers	• Good practices on harvest and post-harvest handling. • Use of simple machines for harvesting and post harvest handling.	• Training and adoption of good practices of harvest and post-harvest handling. • Innovating simple and cost effective machines for harvesting and post harvest handling.	Farmer, ESS, PES, RIE, WYEL, CBDO, APS, Facilitator Wheat, CIGs	700.00
5.	Marketing	• Accidents and injuries during loading and off-loading. • Food wastes and losses during transportation. • Food wastes and losses during storage.	Farmer, Transporter, Marketer, Workers	• Use of supporting equipment for loading and off-loading. • Ensure proper packaging during transportation. • Ensure adequate storage facilities are provided and used to reduce wastes.	• Ensure that farmers and transporters use standard packaging materials and means of transportation • Ensure the use of standard procedure for processing paddy.	Farmer/ Marketer, ESS, RIE, WYEL, CBDO, APS, Facilitator Wheat, CIGs	800.00

Monitoring cost for Significant Potential Adverse Impacts for Wheat Processing

S/n	Activities	Environmental and social impact	Key Receptors	Mitigation measures	Monitoring	Responsibility	Monitoring cost
1.	Wheat Milling	• Procurement of poor-quality machines and equipment. • Increase in amounts of dust and exhaust fumes from vehicle movement and milling machines. • Noise and vibration. • Generation of solid wastes. • Risk of injury and accidents from operating processing machines. • Product contamination due to improper sanitation and hygiene in plant	Millers, Marketers, Public	• Ensure all procurement, construction and installation activities followed approved standard. • Sprinkling of water to minimize dusts. • Ensure proper handling and disposal f solid waste generated. • Use of Personal Protective Equipment including goggles and face masks during activities • Use of noise protection devices. • Use standard sanitation and hygiene protocols	• Check the environment for the status of the wastes. • Ensure the provision of wastes disposal sites for the millers. • Monitor the use of Personal protective equipment in plant • Ensure compliance to standard protocols in the plant. • Enhance innovation of local milling equipment. • Train millers on the use of milling equipment.	Processor, ESS, APS, CBDO, RIE, WYEL, Facilitator Wheat, CIGs	1,500.00
2.	Gurasa Production	• Generation of solid wastes and wastewater. • Product contamination due to improper sanitation and hygiene	Gurasa makers, Neighbouring communities, Gurasa marketers	• Proper waste management • Use of standard protocols for sanitation and	Ensure compliance with waste management Plan. Ensure adherence to	Processor, ESS, APS, RIE , CBDO, WYEL, COO, Facilitator	1,500.00

		in processing plant. • Improper inclusion of food additives and related chemicals in the finished product. • Increased use of firewood for energy. • Inadequate technology use in making *gurasa*. • Direct contact to heat source causing dehydration and physical burns. • Risk of fire incidence		hygiene in plants • Ensure the use of standard food processing protocols approved by NAFDAC • Promote the use of alternative energy like Liquefied Natural Gas. • Plant trees around the processing areas. • Provide a modern oven for *gurasa* making. • Consistent use ofPPE. • Frequent medical checkups at least one in six months. • Provide fire extinguishers in the plants.	standard food processing protocols in plant. Ensure sensitization on the use of alternative energy sorce andtree planting.. Encourage fabrication of *gurasa* making oven. Ensure that gurasa makers undergo medical checkups within the stipulated time. Training on the use of fire extinguishers.	Wheat, CIGs	

Monitoring cost for Significant Potential Adverse Impacts for Tomato Production

S/N	Activities	Environmental and social impact		Mitigation measures	Monitoring	Responsibility	Monitoring cost
1.	Pre-cropping activities	• Poor site selection (poor soil and water quality). • Interference on biodiversity conservation (changes in flora and fauna)	Farmers, Community members, Air, Soil, flora, fauna	• Selection of a good site for cropping activities • Avoid environmentally sensitive sites and unnecessary exposure to	Soil and water quality tests to be compared with post	Farmer, ESS, PES, RIE, WYEL, CBDO, COO, Facilitator	1,000.00

		• Cultivation of single crop may alteration of natural vegetation due to cultivation of single crop • Deterioration from burning of biomass of cleared forest and addition of carbon into the atmosphere • Increased runoff from land clearing and maximum tillage leading to soil quality and nutrient loss. • Loss of valuable natural plant species that are of medicinal value to the neighboring communities. • Removal of the topsoil from cuttings of trees and shrubs • Oil leakages from vehicles impacting surface water negatively. • Risk of work-site accidents from the improper handling of machines and equipment. • Dust and gas emissions from the discharge of particulates that may increase respiratory disease around the sub-project vicinity		sensitive habitat • Consult Forestry Department in the selection and use of such sites • Avoid burning of biomass as much as and the use of fire only in situations where this is least environmental damaging. • Adopt Minimum tillage • Create natural plant protection zone. • Ensure that the trees and shrub are cut down only where necessary • Regular maintenance of vehicles. • Use of PPE and machine manuals. • Use of noise protection. • Ensure trees are planted in the area.	cropping levels. Ensure also that tress are planted in the areas.	Tomato, CIGs	
2.	Production level	• Surface water contamination through the excessive application of fertilizer. • Extreme weather conditions	Surface water, underground water, Crop	• Minimum use of fertilizer and introduction of organic fertilizers. • Establish cropping calendar	• Water quality tests • Adherence to Cropping	Farmer, ESS, PES, RIE, WYEL, CBDO, COO,	1,000.00

		such as heavy rains. • Pests emergence		• Integrated pest management plan.	calendar to suit weather.	Facilitator Tomato, CIGs	
3.	Farm operation and management	• Disposal of Agro-chemicals container • Human health through the pollution of water sources from production wastes and residues	Soil, Surface water, Farmer, Community members	• Proper disposal of Agro-chemical containers. • Training on agro-chemical containers handling. • Pipe-borne water should be provided in the long term to all the farmers	• Trainings on disposal of agrochemical containers. • Check for the availability of Pipe-borne water	Farmer, ESS, PES, RIE, WYEL, CBDO, COO, Facilitator Tomato, CIGs	800.00
4.	Harvest and post-harvest handling	• Accidents and injuries. • On-farm losses of tomato fruits.		• Good safety operation practices during harvest and post-harvest handlings. • Use simple tomato harvesting and collection implement.	• Ensure adherence to safety protocols. • Ensure innovation of simple tomato harvesting and collection implements.	Farmer, ESS, APS, RIE, WYEL, CBDO, COO, Facilitator Tomato, CIGs	1,500.00
5.	Marketing	• Accidents and injuries during loading and off-loading. • Contamination and deterioration of fruits due to excessive use of traditional woven baskets. • Destruction of fruits by pests. • Fruit wastes and losses during	•	• Use of proper method and appropriate aid tools for loading and off-loading. • Provide adequate storage facilities in aggregation centres. • Use of Returnable Plastic Crates. • Ensure the use of IPM Plan. • Use of appropriate means of	Ensure the use of proper method and aid tools.	Farmer/ Marketer, ESS, APS, RIE, WYEL, CBDO, COO, Facilitator Tomato, CIGs	1,500.00

		transportation		transportation.			

Monitoring cost for Significant Potential Adverse Impacts for Tomato Processing

S/n	Activities	Environmental and social impact	Key Receptors	Mitigation measures	Monitoring	Responsibility	Monitoring cost
	Production of dried tomato	• Generation of solid wastes and wastewater. • Product contamination due to improper sanitation and hygiene during drying of sliced tomatoes.	Farmers, Processors, Marketers	• Proper waste management • Use of standard drying facilities	• Ensure the implementation of waste management plan • Ensure the use of proper drying facilities	Processor, ESS, APS, RIE , CBDO, WYEL, Facilitator Tomato, CIGs	1,500.00
	Production of tomato Paste	• Improper site selection process. • Procurement of poor-quality machines and equipment • Increase in amounts of dust and exhaust fumes from vehicle movement on the site • Generation of solid wastes and wastewater. • Product contamination due to improper sanitation and hygiene in processing plant • Improper inclusion of food additives and related chemicals in the finished product.	Farmers, Processors, Marketers	• Ensure proper site selection procedures. • Ensure all procurement, construction and installation activities follow approved standard. • Ensure the innovation of simple tomato processing machines. • Sprinkling of water to minimize dust • Proper waste management • Use of standard protocols for sanitation and hygiene in plants	• Ensure the suitability of the site for tomato paste production. • Ensure the implementation of waste management plan • Provide simple tomato processing technology. • Ensure adherence to standard protocols. • Ensure that IPM Plan is strictly adhered to.	Processor, ESS, APS, RIE , CBDO, WYEL, Facilitator Tomato, CIGs	1,500.00

				• Ensure the use of standard food processing protocols approved by NAFDAC. • Ensure that trees are planted in the area.	• Sensitize the processors on the need to plant trees around the plant.		

Annex VI: Pictures of Interview Sessions with PAPs/Communities

Consultation with *Gurasa* Makers at Dala Local Government

Consultations with Community Members at Rijiyar Zaki,Ungoggo Local Government

Consultations with Community Members at Bunkure, Bunkure Local Government

Consultations with Community Members at Jobe, Dawakin Tofa Local Government

Consultations with Community Members at Shanono, Shanono Local Government

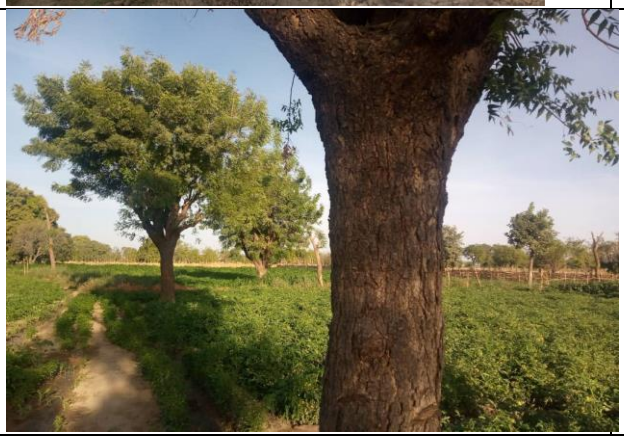
Consultations with Community Members at Kiyawa, Bagwai Local Government

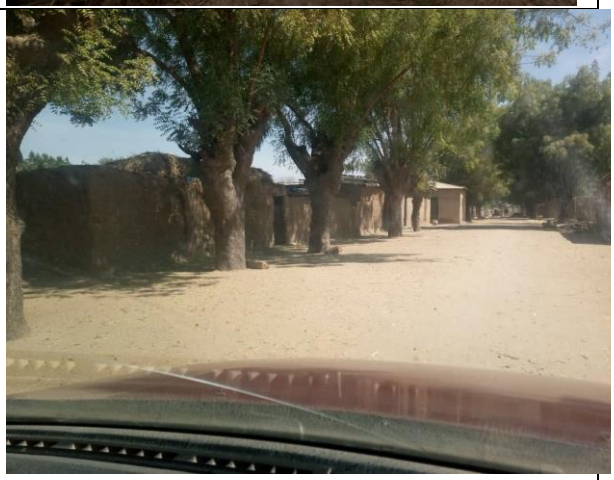
Consultations with Community Members at Dan Hassan, Kura Local Government

Rice Mills at Jobe, Dawakin Tofa Local Government

Consultations with Community Members Rurum, Rano Local Government

Photos	Photos





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