Improving Agriculture and Food Systems Infrastructure to Enhance Resilience and Adaptation to Climate Change in Nigeria

1. Executive Summary

Nigeria's food systems are highly vulnerable to climate change due to weak agricultural infrastructure, erratic rainfall, degraded soils, and limited access to post-harvest and market facilities. Inadequate irrigation, storage, and transport infrastructure compound productivity losses and increase exposure to climate shocks.

This project seeks to strengthen Nigeria's agriculture and food systems infrastructure to enhance resilience and adaptive capacity across the value chain. It aims to improve water management, climate-resilient storage and processing, renewable energy integration, and digital climate services to reduce losses, increase productivity, promote inclusive growth and reduce GHG emissions.

Anchored in Nigeria's Nationally Determined Contribution (NDC), National Adaptation Plan (NAP), Agriculture Promotion Policy (APP), and National Climate Change Policy (NCCP), the initiative aligns with national food security, resilience, and low-emission development priorities. It will leverage blended finance, public–private partnerships, and climate funds to pilot interventions in three agroecological zones, with scalable models for nationwide adoption.

Estimated Budget (Pilot Phase): USD 9 million
Duration: 4-year pilot phase with 10-year scale-up roadmap
Lead Agency: National Council on Climate Change (NCCC)
Implementing Partners**:** Federal Ministry of Agriculture and Food Security (FMAFS), Federal Ministry of Water Resources and Sanitation (FMWR), State Ministries of Agriculture, Agricultural Development Programmes (ADPs), private sector agritech firms, research institutions, and local cooperatives.

2. Problem Statement

Nigeria's agricultural infrastructure is ill-equipped to cope with the increasing frequency and intensity of climate shocks, droughts, floods, heatwaves, and pests. These challenges disrupt food supply chains, exacerbate rural poverty, and threaten national food security.

Key challenges include:

- Limited irrigation coverage (<2% of cultivated land), increasing vulnerability to rainfall variability.
- Poor rural road networks and storage facilities leading to **30–40% post-harvest losses**.
- Outdated and inefficient processing facilities with high energy intensity.
- Inadequate market access and cold chain infrastructure, especially for perishable commodities.
- Weak integration of climate information and early warning systems into farming decisions.
- Limited financial and institutional capacity to maintain and expand resilient infrastructure.

Meanwhile, Nigeria's NDC identifies infrastructure improvement as central to climate adaptation in agriculture, but investments remain fragmented and underfinanced. This project responds to that gap by integrating resilient, low-emission infrastructure solutions across production, processing, and marketing nodes of the food system.

3. Alignment with National and Sectoral Policies

The project is fully aligned with national and international commitments:

Framework	Contribution
Nigeria's NDC 3.0	Supports adaptation priority on climate-resilient agriculture and infrastructure.
National Adaptation Plan (NAP)	Advances adaptation actions on irrigation, storage, and logistics infrastructure.
National Climate Change Policy (NCCP)	Contributes to resilient infrastructure for sustainable development and low-emission growth.
Agriculture Promotion Policy (APP)	Reinforces value chain development and agricultural competitiveness.
National Agricultural Technology and Innovation Policy (NATIP)	Promotes digital agriculture, renewable energy, and innovation-driven resilience.
Economic Recovery and Growth Plan (ERGP)	Enhances sustainable and climate-resilient food systems as a driver of inclusive growth.

4. Goal, Objectives, and Expected Outcomes

Goal:
To strengthen Nigeria's agricultural and food systems infrastructure to enhance resilience, adaptive capacity, reduce GHG emissions and food security under a changing climate.

Specific Objectives and Key Expected Outcomes

Objective	Expected Outcomes
1. Strengthen climate-resilient water and irrigation infrastructure	10,000–20,000 ha under efficient irrigation; reduced drought vulnerability; enhanced crop yields.
2. Enhance climate-smart post-harvest and market infrastructure	Reduction in post-harvest losses by 30%; increased value addition and market access.
3. Integrate renewable energy and digital climate services	Deployment of solar-powered cold rooms, drying units, and irrigation systems; improved climate advisories.
4. Build institutional and community capacity for sustainable management	Strengthened local institutions for infrastructure maintenance, planning, and monitoring.
5. Facilitate access to finance and private sector engagement	Established PPP models and climate finance mechanisms for long-term investment.

5. Project Design and Phased Implementation

Phase 1 (Years 0–2): Foundational and Pilot Implementation

Objectives: Establish baseline data, pilot resilient infrastructure, and test financing models.
Key Activities:

- Baseline mapping of infrastructure gaps, climate risks, and value chain bottlenecks.
- Pilot climate-resilient irrigation systems (solar drip, rainwater harvesting).
- Construct modular climate-smart storage and aggregation centres in three pilot zones.
- Deploy digital weather and market information platforms.
- Build stakeholder capacity on climate-proof infrastructure design and maintenance.

Phase 2 (Years 2–4): Scale-up and Institutional Strengthening

Objectives: Expand infrastructure adoption and integrate models into state and national programs.
Key Activities:

- Scale irrigation and solar-powered cold chains in additional states.

- Integrate resilient infrastructure into state agricultural budgets and investment plans.
- Facilitate public–private partnerships for agro-processing and logistics infrastructure.
- Establish a National Agro-Infrastructure Resilience Task Force under NCCC–FMAFS coordination.

Phase 3 (Years 4–10): Consolidation and Replication

Objectives: Institutionalize and replicate resilient infrastructure models nationally.
Key Activities:

- Develop the *National Resilient Agro-Infrastructure Investment Framework (NRAIIF)*.
- Create a climate finance window within the National Climate Change Fund (NCCF).
- Promote regional knowledge exchange and south–south cooperation on adaptation infrastructure.

6. Theory of Change

If Nigeria strengthens its agriculture and food systems infrastructure through climate-resilient irrigation, renewable energy-powered processing and storage, and digital climate services, then productivity losses will decline, adaptive capacity will increase, and rural livelihoods will become more resilient to climate shocks. These interventions reduce vulnerability to droughts and floods, enhance food system efficiency, and enable inclusive participation in sustainable value chains.

- Inputs: Policy support, finance, technology, partnerships.
- Activities: Infrastructure development, capacity building, digital integration.
- Outputs: Irrigation systems, cold chains, renewable-powered processing units, trained institutions.
- Outcomes: Reduced losses, improved yields, resilient value chains, increased incomes.
- Impact: Climate-resilient, food-secure Nigeria with sustainable rural prosperity.

7. Monitoring, Evaluation, and Learning (MEL)

Core Indicators:

- Hectares under climate-resilient irrigation.
- Post-harvest loss reduction (%).
- Number of solar-powered facilities established.
- Farmers accessing climate advisories and digital tools.
- Women/youth enterprises engaged in processing and marketing.
- Increase in household income and food availability index.

MEL Framework:

- Baseline and midline evaluations every two years.
- Integration of remote sensing for irrigation efficiency tracking.
- Use of digital dashboards for real-time infrastructure performance monitoring.
- Participatory learning reviews and policy briefs annually.

8. Risk Analysis and Mitigation

Risk	Mitigation Strategy
Inadequate maintenance of infrastructure	Capacity-building and establishment of local maintenance funds.
Climate extremes damaging infrastructure	Use of climate-proof materials and designs.
Limited private sector interest	Incentives via PPP models and blended finance.
Institutional coordination delays	Creation of inter-ministerial steering committee under NCCC.
Community conflicts over resource access	Participatory planning and gender-sensitive conflict mediation.

9. Cross-Cutting Issues

- Gender and Social Inclusion: Target women and youth for leadership in storage, processing, and digital climate services.
- Conflict Sensitivity: Promote shared resource use and community mediation structures.
- Renewable Energy Integration: Solarization of irrigation, cold chains, and processing centres.
- Biodiversity Conservation: Use ecosystem-based approaches in water and land management.
- Nutrition Security: Improved preservation and access to diverse, nutritious foods.

10. Sustainability and Scaling Strategy

- Financial Sustainability: Blend of carbon and adaptation finance, agribusiness investment, and productivity gains.
- Institutional Sustainability: Integration into NCCC–FMAFS and state planning cycles.
- Technical Sustainability: Local capacity for infrastructure operation, repair, and monitoring.
- Replication: Development of bankable models for replication under NDC/NAP implementation.

11. Implementation Arrangements

Lead Institution:
National Council on Climate Change (NCCC) – providing strategic oversight, MRV coordination, and climate finance linkages.

Core Partners:

- FMAFS – agricultural infrastructure and extension coordination.
- FMWR – water resources and irrigation management.
- State ADPs and LGAs – field-level implementation.
- Private Sector & Financial Institutions – investment and PPP facilitation.
- Research Institutes (IAR, NCRI, IITA) – technology validation and training.
- Community Cooperatives and Women Groups – ownership and management of assets.

Governance Structure:

- National Steering Committee chaired by NCCC-DG.
- Technical Working Groups on Irrigation, Renewable Energy, and Digital Climate Services.
- State Coordination Units for local supervision.

12. Indicative Budget (Pilot Phase)

Component	**Estimated Cost (USD)**
Baseline Studies and Planning	800,000
Climate-Resilient Irrigation Systems	2.5 million
Solar-Powered Storage and Processing Units	2.0 million
Rural Road and Market Access Infrastructure	1.2 million
Digital Climate and Market Information Systems	700,000
Capacity Building and Institutional Strengthening	1.0 million
Monitoring, Evaluation, and Project Management	800,000
Total Estimated Cost	**USD 9 million**

13. Next Steps

1. Stakeholder Consultation and Baseline Workshop Feasibility and Infrastructure Scoping Study
2. Development of Full Project Proposal and Investment Framework.
3. Engagement with Development Partners
4. Pilot Implementation Launch in selected agroecological zones.

Summary

This initiative presents a transformational opportunity to climate-proof Nigeria's agriculture and food systems, combining resilient infrastructure, renewable energy, and digital solutions to safeguard productivity, enhance adaptation, and unlock sustainable livelihoods. By embedding resilience at every stage, from production to market, the project will help Nigeria achieve its NDC, NAP, and SDG targets while empowering farmers to thrive in a changing climate.