

Consultancy Service for undertaking the Programme Climate, Crop and Livestock Risk Assessment

1 Background and Context

1.1 Country and Climate Context

Mali is among the most climate-vulnerable countries in the Sahel region, with over 80% of rural household's dependent on rain-fed agriculture. Climate change is projected to significantly impact agricultural productivity, with temperature increases and altered precipitation patterns affecting key crops including millet, sorghum, maize, rice, and cotton. These impacts threaten food security, rural livelihoods, and economic stability, with smallholder farmers — particularly women and youth — facing the greatest vulnerability.

The **Scaling Inclusive Climate-Resilient Agriculture Finance in Mali (SICRAF-Mali)** Programme aims to remove systemic barriers to climate finance and promote adoption of climate-smart agriculture (CSA) and renewable energy practices among smallholder farmers, cooperatives, and agribusiness micro, small, and medium enterprises (MSMEs). The Programme comprises two core components:

1. **Component 1:** CSA Concessional Credit Line supporting CSA and low-emission technologies and Targeted Smallholder Climate Finance Facility for vulnerable smallholder farmers
2. **Component 2:** Catalysing Access to Climate Finance through technical assistance

The National Bank for Agricultural Development (BNDA), accredited by the Green Climate Fund (GCF), serves as the Accredited Entity and Executing Entity. BNDA holds approximately 10% of banking deposits and 13% of credit market share, with 52% of its loan portfolio allocated to agriculture.

1.2 Rationale for This Assignment

Component 2 of the SICRAF-Mali Programme integrates climate risk screening into loan appraisal processes to ensure financed investments are technically sound and resilient under local climate conditions. Activity 2.1.1 introduces technical feasibility, viability, and climate risk screening using standardized climate risk screening toolkits that evaluate exposure, sensitivity, and adaptation capacity for proposed investments.

To operationalize these climate risk screening systems and ensure they are scientifically robust, context-specific, and operationally applicable, a comprehensive Programme Climate and Crop Risk Assessment is required. This assessment will:

- Conduct a comprehensive climate risk and impacts assessment in the agricultural sector, using the best available national hydrometeorological data, complemented, where necessary, by alternative international data sources
- Provide detailed crop-specific vulnerability assessments to climate change risks and impacts for Mali's target agricultural zones and value chains
- Develop robust climate, crop, and livestock modelling frameworks using internationally recognized methodologies

- Conduct economic simulations under different climate scenarios to quantify impacts on yields, incomes, and repayment capacity
- Generate actionable risk profiles and adaptation recommendations to inform lending decisions and technical advisory services
- Establish evidence-based foundations for the climate risk screening toolkit and Technical and Climate Viability Certificate system
- Support the development of climate-responsive loan products and risk mitigation mechanisms
- Use the results of the climate risk and impact assessment to develop a strong climate rationale for the Programme, particularly in the section “Climate context” of the funding proposal

The assessment will directly inform Activity 2.1.1 (climate risk screening), Activity 2.1.2 (digital agro-financial advisory), and broader Programme risk management frameworks, ensuring that climate science is embedded into every stage of the lending process.

1.3 Alignment with GCF Requirements

This assessment supports compliance with GCF's requirements for scientifically grounded climate impact evidence, including IPCC-consistent methodologies, and provides data inputs for GCF investment criteria on impact potential and paradigm shift.

2 Objectives

The overall objective is to conduct a scientifically rigorous climate and crop risk assessment that delivers actionable climate science inputs for SICRAF-Mali's lending operations, risk management, and Programme design.

2.1 Specific Objectives:

- Conduct detailed climate risk analysis for Mali's target agricultural zones by analysing historical climate trends 1980-2025 and future projections under SSP2-4.5 and SSP5-8.5 scenarios.
- Develop crop-specific vulnerability assessments for priority value chains using internationally recognized crop modelling frameworks
- Assess CSA technology performance and adaptation effectiveness under projected climate scenarios
- Generate spatial risk maps and zone-specific climate risk profiles for integration into lending systems
- Develop an operational climate risk screening toolkit and Technical and Climate Viability Certificate (TCVC) framework
- Provide specifications for climate advisory services (Activity 2.1.2) and climate-informed portfolio risk management guidance

3 Scope of Work

3.1 Work Package 1: Climate Data Collection and Analysis

3.1.1 Historical Climate Analysis

- Compile and analyse historical climate data (1980–2025) for Mali's agricultural zones: temperature, precipitation, humidity, solar radiation, wind speed, SPEI, and any other relevant climate parameters and index deemed required
- Identify observed trends, variability patterns, and extreme event frequencies (droughts, floods, heat waves)
- Analyse seasonal patterns and shifts in rainfall onset, duration, and distribution
- Map historical climate hazards by agroecological zone and administrative region
- Assess changes in agro-climatic indicators: growing season length, water availability, heat stress days

3.1.2 Climate Projection Development

- Generate high-resolution climate projections for near-term (2025–2040), mid-term (2040–2060), and long-term (2060–2080) periods using ensemble of the latest CMIP GCMs under SSP2-4.5 and SSP5-8.5
- Downscale global projections to approximately 10 km resolution using statistical or dynamical methods
- Develop projections for key variables: temperature, precipitation, evapotranspiration, soil moisture, extreme indices
- Assess uncertainty ranges and model agreement across ensemble projections
- Document all bias correction methods and downscaling approaches

3.1.3 Spatial Climate Risk Mapping

- Develop GIS-based climate risk maps at administrative region and district levels
- Map spatial distribution of key hazards: drought risk, flood risk, heat stress, water scarcity, rainfall variability
- Overlay climate hazard maps with agricultural land use, population density, and infrastructure
- Produce maps in formats suitable for integration into BNDA's loan origination and risk screening systems

3.2 Work Package 2: Crop & Livestock Modelling and Vulnerability Assessment

3.2.1 Target Crop and Value Chain Selection

- Develop a transparent and evidence-based methodology to justify the selection of priority crops/value chains for modelling (e.g., criteria, scoring/decision rules, data sources, and stakeholder validation).
- Prioritize crops: cereals (e.g., millet, sorghum, maize, rice), cash crops (e.g. cotton, groundnut, sesame), horticulture (e.g., mango, onion, tomato), livestock (climate-fodder interactions)
- Define specific crop varieties, management practices, and production systems
- Identify geographic focus areas for each crop

3.2.2 Crop Model Selection and Calibration

- Select models: DSSAT (CERES-Millet, CERES-Sorghum, CERES-Maize, CERES-Rice), APSIM for millet/sorghum/groundnut, AquaCrop for irrigated systems
- Calibrate using Mali-specific field trial data, agricultural statistics, and soil parameters
- Validate outputs against observed yields (target $R^2 > 0.7$, RMSE < 20% of mean yield)
- Document all model assumptions, parameters, and performance metrics

3.2.3 Crop-Climate Simulation Analysis

- Run crop models under baseline and future climate scenarios for near, mid, and long-term periods
- Simulate yields, biomass, water use efficiency, and phenological responses
- Assess impacts of water stress, heat stress, nitrogen availability, and pest/disease pressure
- Analyse sensitivity of crop varieties to climate variability
- Model crop failure probabilities and yield variability under climate uncertainty

3.2.4 Vulnerability and Adaptation Capacity Assessment

- Develop crop-specific vulnerability indices (exposure, sensitivity, adaptive capacity)
- Identify critical vulnerability thresholds for each crop-zone combination
- Assess differential vulnerability: rain-fed vs. irrigated, traditional vs. improved varieties
- Evaluate climate risks throughout value chains: production, post-harvest (e.g., data on post-harvest losses), storage, processing
- Map geographic hotspots of high crop vulnerability

3.3 Work Package 3: CSA Technology Performance Assessment

Note: This Work Package assesses the agronomic/biophysical performance of CSA technologies under climate scenarios. Financial and economic returns of these technologies are analysed exclusively under IFEA

3.3.1 CSA Technology Inventory and Selection

- Compile inventory of relevant CSA technologies: improved varieties, water management, soil fertility management, agroforestry, post-harvest technologies, renewable energy for agriculture
- Prioritize technologies for detailed assessment based on programme financing priorities and adoption potential

3.3.2 Technology Performance Modelling Under Climate Scenarios

- Model biophysical performance and effectiveness of prioritized technologies under baseline and future climate scenarios
- Simulate yield improvements, water savings, and resilience gains from technology adoption
- Assess technology robustness across different agroecological zones
- Identify technology-climate mismatch risks (technologies that may underperform under extreme scenarios)
- Model synergies and trade-offs of technology combinations

3.3.3 Adaptation Effectiveness Analysis

- Define a without-project / no-adaptation baseline under projected climate conditions (using SSP2-4.5 and SSP5-8.5 scenarios), specifying expected productivity losses, income volatility, and financial stress among smallholders in the absence of SICRAF-Mali interventions.
- Develop an attribution narrative that clearly distinguishes climate change-driven impacts (e.g., increasing drought frequency, irregular rainfall, heat stress on crops) from non-climate development constraints (e.g., limited market access, credit barriers, infrastructure gaps).
- Demonstrate how SICRAF-Mali financed investments measurably reduce climate vulnerability relative to the baseline, including a quantitative assessment of avoided climate-related losses and enhanced adaptive capacity.
- Develop adaptation roadmaps showing sequencing of interventions

Output: Technology-climate suitability matrices and adaptation effectiveness data delivered to IFEA for integration into financial models.

3.4 Work Package 4: Climate Risk Profiling and Screening Tool Development

Note: This Work Package develops the climate risk classification and operational screening tools. Financial viability thresholds within the Technical and Climate Viability Certificate (TCVC) are developed under IFEA and integrated into the TCVC framework designed here.

3.4.1 Climate Risk Classification Framework

- Develop multi-criteria risk classification system: Very High / High / Moderate / Low risk zones
- Define quantitative thresholds and decision rules for risk classification
- Create risk matrices linking geographic zones, crops, and farming systems to risk levels
- Define the set of resilience outcome metrics to be reported and establish a harmonised framework for their application, ensuring consistent measurement, aggregation, and reporting across different value chains and geographic zones.

3.4.2 Zone-Specific Climate Risk Profiles

- Generate comprehensive risk profiles for each administrative region and district including: dominant climate hazards, priority crops with vulnerability assessments, historical impacts and future projections, recommended CSA technologies, lending risk considerations
- Produce standardized risk profile templates for integration into loan appraisal systems

3.4.3 Climate Risk Screening Toolkit Design

- Design operational screening toolkit for BNDA Technical Credit Agents and PFI staff
- Develop user-friendly screening questionnaires, checklists, and decision trees
- Develop metrics to assess whether financed practices may generate maladaptation risks, including potential increases in water stress, land degradation, or inequitable access and benefit distribution, and define corresponding mitigation measures as well as any applicable exclusion or eligibility criteria.
- Create scoring systems linking responses to risk categories and recommended actions

3.4.4 Climate Risk Assessment for Livestock Systems

- Identify and characterize key climate hazards affecting livestock systems in the programme areas, including recurrent droughts, heatwaves, changes in rainfall patterns, floods, and associated disease and parasite outbreaks
- Map exposure of different livestock production systems (pastoral, agropastoral, mixed crop–livestock, peri-urban) and species (cattle, small ruminants, poultry and others as relevant) to these climate hazards across target agroecological zones.
- Assess sensitivity and adaptation capacity of livestock keepers, with particular attention to smallholder and vulnerable groups (including women and youth livestock keepers), considering feed and water availability, animal health services, mobility, access to markets, and use of climate information services.

- Analyse historical and projected climate trends (temperature, rainfall variability, drought/flood frequency) in key livestock zones over the programme time horizon to determine likely changes in risk profiles and “hotspots” of climate risk for livestock production.
- Assess implications of climate risks for livestock-based livelihoods and value chains, including impacts on herd size and composition, productivity (milk, meat, draft power), mortality, reproduction, product quality and storage, and access to markets and processing facilities.
- Identify and recommend priority climate-resilient livestock management and value chain measures (e.g., climate-resilient fodder and pasture management, water harvesting and storage for livestock, shade and housing, heat-tolerant breeds, strengthened animal health and surveillance systems, climate-informed grazing management, index-based livestock insurance, emergency response protocols) aligned with programme objectives and GCF adaptation guidance.
- Propose livestock-specific climate risk and resilience indicators (e.g., number of livestock keepers with enhanced resilience, proportion of herds managed under climate-resilient practices, reduction in climate-related livestock mortality) for integration into the programme’s results framework and MRV system

3.4.5 Technical and Climate Viability Certificate (TCVC) Framework

- Develop standardized TCVC template integrating climate risk findings
- Define certificate components: climate risk rating, required resilience measures, technology suitability confirmation
- Establish approval criteria linking climate risk levels to loan terms, conditions, and safeguards (financial viability thresholds for the TCVC, such as minimum IRR and DSCR, are supplied by IFEA activity)
- Design quality assurance protocols for consistency and reliability

3.5 Work Package 5: Technical Documentation

- Prepare comprehensive technical reports documenting methodologies, data sources, model outputs, and findings
- Develop user manuals for climate risk screening toolkit and TCVC system.
- Undertake post-submission technical support to address GCF Project Appraisal, CIC 3 review, and ITAP review comments for ALL work packages

4 Deliverables

1. Inception Report — work plan, methodology, data sources, model selection justification, stakeholder engagement plan
2. Climate Data Analysis Report — historical trends, projections (SSP 4.5 and 8.5), spatial risk maps, hazard profiles by zone
3. Crop Modelling and Vulnerability Report — model calibration, simulations, yield projections, vulnerability indices, critical thresholds

4. CSA Technology Assessment Report — technology performance under climate scenarios, adaptation effectiveness, technology-climate suitability matrices
5. Climate Risk Screening Toolkit and Operational Tools Package — risk classification framework, zone-specific profiles, screening questionnaires, TCVC template (climate component), user manuals (WP4)

5 Qualifications and requirements

The firm must demonstrate:

- At least 5 years' experience in undertaking climate and crop modelling scenarios
- Proven track record undertaking climate and/or crop risk assessments, climate vulnerability assessments, or climate-smart agriculture studies in Sub-Saharan Africa
- Evidence of at least 3–5 comparable assignments over the past 4 years (climate/crop risk assessments, climate-smart agriculture or related analytical work)
- Demonstrated experience working with multilateral climate funds or development partners (e.g., GCF, Adaptation Fund, World Bank, IFAD, AfDB, UN agencies) on similar assignments.
- Ability to design and implement a robust climate and crop risk assessment methodology (hazard, exposure, sensitivity, adaptive capacity, overall risk).
- Proven experience with climate and agricultural datasets (e.g., national meteorological data, CHIRPS, ERA5, satellite-based rainfall and vegetation indices, national agricultural statistics).
- Familiarity with crop and climate risk modelling tools
- Declaration that the firm has not been debarred by the GCF, World Bank, AfDB, or any other multilateral development institution
- Working knowledge in both English and French

6 Evaluation criteria

The evaluation of candidates will be carried out based on the information provided in the application and according to the criteria for evaluating offers and BNDA's internal policies and procedures. The criterion is hence provided.

	Description	<i>Maximum Score</i>
1	Specific experience of the firm in performing similar assignments in the last five years	30
2	Competence and capacity of the key staff for the assignment	20

3	Adequacy of The Proposed Work Plan in Responding to The Terms of Reference [Detailed work plan: List of proposed activities; Adequacy of proposed timelines; Synchronization of activities]	10
4	Understanding and Conformity of the Tenderer's Response to the Terms of Reference (TORs) and Completeness of Description of Methodology. Preparation of the deliverables In Line with GCF Requirements [Clarity of scope of work; Clearly explained procedure; Theoretical/conceptual framework; Clearly defined inputs and outputs]	20
5	Financial proposal put forward by the consultant	20
TOTAL SCORE		100

6.1 Administrative Documents

Under this Call for Proposals, BNDA requires bidders to submit the following administrative documents:

- A valid Commercial Registration Certificate;
- A valid Tax Clearance Certificate and proof of compliance with social security obligations;
- A Certificate of Non-Bankruptcy issued no more than three (3) months prior to the submission date.

Note: Failure to provide any of the above documents shall result in the rejection of the proposal.

In addition to the administrative documents, each bidder shall submit separately:

- Technical Proposal; and
- Financial Proposal.

6.2 Technical Proposal

The Technical Proposal shall include, at a minimum:

- A Proposal Submission Letter signed by the duly authorized representative of the consulting firm;
- A presentation of the firm, its organizational structure, areas of expertise, and key competencies;
- Relevant references and experience in carrying out similar assignments, particularly in the areas covered by these Terms of Reference (TOR);
- A clear understanding of the objectives of the assignment, the associated challenges, and the expected results;
- The proposed methodology and technical approach, including in particular:
 - the different phases of implementation;

- the main activities to be carried out;
- the tools and methods to be employed;
- the quality assurance mechanisms to be applied to the deliverables;
- A detailed work plan and implementation schedule;
- An approach describing how any comments or recommendations from the Green Climate Fund (GCF) will be addressed and incorporated;
- The composition of the proposed team, specifying the roles and responsibilities of each expert;
- Detailed curricula vitae (CVs) of the key experts, signed or otherwise endorsed by the individuals concerned, highlighting their relevant qualifications and experience;
- The availability and mobilization arrangements of the proposed experts;
- Any additional information the bidder considers useful in demonstrating its capacity to perform the services covered by the contract.

6.3 Financial Proposal

The Financial Proposal shall be submitted separately from the Technical Proposal and in sufficient detail to allow for a transparent evaluation of costs.

It shall include, in particular:

- Fees of international experts;
- Fees of national experts, where applicable;
- The number of person-days allocated to each expert;
- Travel and transportation costs;
- Accommodation and subsistence expenses;
- Any other costs directly related to the performance of the services;
- Applicable taxes, duties, and other charges;
- The total amount of the Financial Proposal.

The bidder shall provide a detailed cost breakdown by activity, deliverable, or expenditure category.

The Financial Proposal shall be expressed in United States Dollars (USD).

6.4 Evaluation of Financial Proposals

The Financial Score (N_f) shall be calculated as follows:

Let F_m be the amount of the lowest-priced Financial Proposal.

This proposal shall receive a Financial Score of 100 points.

The Financial Score of the other bidders shall be calculated using the following formula:

$$N_f = 100 \times F_m / F$$

Where:

- F_m = amount of the lowest-priced Financial Proposal;
- F = amount of the Financial Proposal under evaluation.

6.5 Final Ranking and Contract Award

The contract shall be awarded to the bidder obtaining the highest combined score resulting from the technical and financial evaluations.

The Overall Score (N) shall be calculated as follows:

$$N = [80 \times \text{Technical Score (Nt)} + 20 \times \text{Financial Score (Nf)}] / 100$$

The contract shall be awarded to the bidder obtaining the highest Overall Score.

7 Proposal Submission Instructions

Bidders are invited to submit their Technical and Financial Proposals, together with all required supporting documents, in electronic format and protected by password, to the following email addresses:

- ASCOULIBALY@bndamali.com
- SETRAORE@bndamali.com
- modiallo@bndamali.com

The deadline for submission of proposals is: 10 November 2026 at 4:00 p.m. (Bamako time).

The passwords or access keys required to open the submitted files shall be transmitted separately on: 11 November 2026 to the same email addresses listed above.

Any request for clarification regarding the preparation of proposals may be submitted by email to: ascoulibaly@bndamali.com

Any proposal received after the submission deadline may be rejected as non-responsive in accordance with the provisions governing this selection process.

8 Contract Duration and Implementation Schedule

The services covered by the contract shall be carried out over a period of thirty (30) working days, commencing from the date of contract award notification to the successful bidder

The detailed implementation schedule shall be finalized with the successful bidder upon commencement of the assignment and shall comply with the requirements set out in these Terms of Reference.