

## Monitoring & Evaluation (M&E) Plan and Impact Statement

### Objective of the M&E Plan and Impact Statement:

- The M&E Plan and Impact Statement must be designed based on the Technical Assistance Response Plan and must enable the Implementer to complete the Closure Report at the end of the assistance.

Basic Information	
Title of response plan	<b>Upscaling Lowland Rice Production to improve food security through improved solar powered irrigation practices</b>
Technical assistance reference number	<b>AFCIA 2021000017</b>
Country/ countries	<b>Liberia</b>
NDE focal point and organisation	<b>Mr. Christopher B. Kabah</b> TNA National Coordinator Environmental Protection Agency of Liberia <a href="mailto:kabahchristopher@gmail.com">kabahchristopher@gmail.com</a>
Sector(s) addressed	<b>Renewable Energy</b> <b>Agriculture</b>
Technologies supported	<b>Solar Powered Irrigation Systems (SPIS) i.e., solar water pumps with crop-targeted drip irrigation system.</b>
Implementation period and total duration	<b>22/11/2021 - 17/02/2023</b> <b>(14 Months)</b>
Total budget for implementation	<b>USD 233,825</b>
Designer of the response plan	<b>CTCN</b>
Implementer of response plan	<b>CARES Limited and INTEGRATION environment &amp; energy GmbH</b>

<b>(A) Outputs and Activities as described in the Response Plan</b>	<b>(B) Indicator</b>	<b>(C) Expected results</b>	<b>(D) Method and frequency for data collection</b>	<b>(F) Comments</b>
<b>Output 1:</b> Analyse the current irrigation and rice cultivation practices in Liberia	1 x Report on the challenges and recommendations for irrigation and rice cultivation.	Report on challenges and recommendations for irrigation and rice cultivation, customized to the selected county and taking gender and youth into consideration.	- SRI Irrigation Report; diagnosing the current irrigation systems used for SRI and rice production in Liberia, selecting the most suitable county and benchmarking international irrigation systems for SRI from countries with similar socio-economic, geographic and climatic conditions - TA Closure Report	Dependent upon the availability of existing reports and data. Physical presence at meetings and field exercises dependent on Covid-19 travel restrictions.
Activity 1.1: Map relevant stakeholders and establish a stakeholder working group	Stakeholder Working Group (SWG) established. Anticipated number of direct and indirect beneficiaries as a result of the TA	Approx. 20 stakeholders identified through stakeholder mapping. 1 x SWG with up to 8 participants (gender-balanced).	- Stakeholder Mapping Report (containing a complete stakeholder list, and a description of the SWG - including name, position, institution, gender and role of each member). - TA Closure Report	Dependent on the willingness of (gender-balanced) stakeholders to participate in the SWG Care should be taken not to have a SWG biased towards one County
Activity 1.2: Conduct a virtual inception meeting	Anticipated number of direct and indirect beneficiaries as a result of the TA Total number of events organized by proponents and implementing partners Number of participants in events	1 x Inception Meeting with ≥20 Participants: From stakeholder groups including government, private sector, civil society, academic sector, NGOs, farmers, academia, private sector, farming cooperatives, gender & youth associations.	- Inception Meeting Report with list of participants (including name, position, institution, gender and role of each member). - TA Closure Report	Physical presence dependent on Covid-19 travel restrictions

<b>(A) Outputs and Activities as described in the Response Plan</b>	<b>(B) Indicator</b>	<b>(C) Expected results</b>	<b>(D) Method and frequency for data collection</b>	<b>(F) Comments</b>
Activity 1.3: Diagnose current irrigation system in Bong and Lofa	Interviews held with key stakeholders Anticipated number of direct and indirect beneficiaries as a result of the TA Anticipated number of deliverables	≥15 Stakeholder Interviews: From key groups including NGOs, private sector farmers, lowland farming co-ops, academia, and gender & youth associations. 1 x SRI irrigation report.	15 brief minutes of the interviews with name of participants disaggregated by gender, questions raised and main inputs received. - SRI Irrigation Report presenting diagnosis of current irrigation systems used for SRI and rice production in Liberia. - TA Closure Report	Dependent on obtaining contact details of suitable and willing key stakeholders.
Activity 1.4: Select best pilot sites between Bong and Lofa	Bong or Lofa county selected for pilot site	1 x County selected for pilot.	- County Selection Report - TA Closure Report	SWG may not agree with choice of pilot county
Activity 1.5: Benchmark international best irrigation practices in SRI from countries with similar socio-economic, geographic and climatic conditions	Interviews held with key stakeholders from similar countries	≥5 People / Countries interviewed to determine best practices in SRI irrigation, including implementing entities/executing agencies and beneficiaries. Interviews obtain: - Lessons learnt - Challenges - Mistakes - Best technologies.	- List of stakeholders interviewed from elsewhere in the world (including name, position, institution, gender and role of each member) included in the SRI Irrigation Report - TA Closure Report	Best practices in SRI irrigation likely to be highly socio-economic, geographic and climatic dependent.
Activity 1.6: Identify challenges and requirements in the context of irrigation and rice cultivation practices, taking into account specific barriers for women and youth.	Number of deliverables	1 x SRI Irrigation Report; includes sections detailing challenges faced by women and youth in utilising irrigation, and rice cultivation.	- SRI Irrigation Report - TA Closure Report	

<b>(A) Outputs and Activities as described in the Response Plan</b>	<b>(B) Indicator</b>	<b>(C) Expected results</b>	<b>(D) Method and frequency for data collection</b>	<b>(F) Comments</b>
<b>Output 2:</b> Design appropriate irrigation and solar water pumping technologies for SRI based farming in the selected county	Number of deliverables	1 x Outline Design Report defining the best configuration of the SPIS model for SRI in the selected county of Liberia	- Outline Design Report	Complete datasets to understand the demand side of SPIS may not be available. Physical presence for field exercises dependent on Covid-19 travel restrictions.
Activity 2.1: Gather data to understand the demand side of the fit-for-purpose SPIS	Data requested to understand irrigation water demands for selected county	Data requested to understand the demand side of SPIS includes meteorological, hydrological, soil, and crop data.	- Design Statement Report - TA Closure Report	Complete datasets may not be available
Activity 2.2: Collect data to define PV pump system and irrigation infrastructure (supply side)	Data analysed and compared to define fit-for-purpose PV pump system and irrigation infrastructure to take account of local conditions and cultivation practices.	Photovoltaic pump system requirements determined through an analysis of head / pressure (TDH) (m), daily volume (m <sup>3</sup> /day); solar generator size (W <sub>peak</sub> ); pump and motor size (m <sup>3</sup> /h) and (kW); and functionality.	- Design Statement Report - TA Closure Report	Complete datasets may not be available
Activity 2.3: Define the configuration of the SPIS	Number of deliverables	1 x Outline Design Report  Includes justifying a direct pumping, multi-use system, mini grids set up, hybrid system etc.	- Outline Design Report - TA Closure Report	Suitability of chosen configuration will be dependent on the availability of both the demand and supply side datasets
<b>Output 3:</b> Select appropriate SPIS technology	Number of deliverables	1 x Preliminary Design and Selection Report	- Preliminary Design and Selection Report	
Activity 3.1: Elaborate fact sheets on appropriate technologies for the SPIS configuration defined	Number of deliverables	3 x SPIS technologies recommended for adoption.	- SPIS Technology Fact Sheets - TA Closure Report	

<b>(A) Outputs and Activities as described in the Response Plan</b>	<b>(B) Indicator</b>	<b>(C) Expected results</b>	<b>(D) Method and frequency for data collection</b>	<b>(F) Comments</b>
Activity 3.2: Define cost estimation of the identified technologies under the configuration designed	Number of deliverables	1 x BoQ for chosen configuration.	- Engineers' Cost Estimates prepared as costed Bills of Quantities (BoQs) included in the Preliminary Design and Selection Report - TA Closure Report	
Activity 3.3: Organize a one-day workshop with the stakeholder working group	Total number of events organized by proponents and implementing partners  Number of participants in events	1 x Day Workshop with the SWG: Up to 8 participants.	- Minutes of SWG workshop included in the Preliminary Design and Selection Report - TA Closure Report	
Activity 3.4: Organize a 3-hours stakeholders' workshop to present the selected technology	Total number of events organized by proponents and implementing partners  Number of participants in events	1 x 3-hr Workshop Including reps. of - women - youth - the vulnerable. ≥50 participants	- Minutes of the stakeholders' workshop including list of participants included in the Preliminary Design and Selection Report - TA Closure Report	
<b>Output 4:</b> Pilot a small-scale implementation of the solar pumping system in the selected county of Liberia	Area developed under SPIS pilot scheme  Anticipated number of direct and indirect beneficiaries as a result of the TA	1 x SPIS handed over to intended beneficiaries. 5-10 ha SPIS development 10-20 farms/farmers and their families directly benefitting from the pilot SPIS scheme.	- Installation Report - TA Closure Report	Assume that farmers and their families will benefit directly from the pilot SPIS scheme, yet it is dependent on the cost of water supply and storage infrastructure, and monitoring and control systems, and the land allocated to each farmer, as well as the success of the pilot scheme.
Activity 4.1: Choose a plot in the selected county for a small-scale pilot implementation of the selected SPIS	Site visit to the selected pilot scheme area to choose the plot	1 x Day Site Visit with the SWG	- Site Visit Report - TA Closure Report	Physical presence at meetings and field exercises dependent on Covid-19 travel restrictions.

<b>(A) Outputs and Activities as described in the Response Plan</b>	<b>(B) Indicator</b>	<b>(C) Expected results</b>	<b>(D) Method and frequency for data collection</b>	<b>(F) Comments</b>
Activity 4.2: Plan the implementation of the pilot project	Number of Deliverables	Implementation Plan includes requirements for implementing the pilot project in the selected area detailed, to include: - Technical - Human - Financial.	- Implementation Plan - TA Closure Report	
Activity 4.3: Organize an online meeting to discuss the logistics and implementation of the pilot	Total number of events organized by proponents and implementing partners Number of participants in events	1 x Online Meeting with SWG Up to 8 participants.	- Report on meeting included in the Implementation Plan - TA Closure Report	
Activity 4.4: Route the technology to the selected area	Order placed for the technology	Material received on site.	- TA Closure Report	
Activity 4.5: Implement the small-scale project in the pilot area	Anticipated number of direct and indirect beneficiaries as a result of the TA	1 x SPIS handed over to intended beneficiaries. 5-10 ha SPIS development 10-20 farms/farmers and their families directly benefitting from the pilot SPIS scheme.	- Installation Report - TA Closure Report	Assume that farmers and their families will benefit directly from the pilot SPIS scheme, yet it is dependent on the cost of infrastructure and control systems, and the land allocated to each farmer, as well as the success of the pilot scheme.
<b>Output 5:</b> Elaborate and disseminate training's materials and workshops	Total number of events organized by proponents and implementing partners	1 x Workshop 1 x Training session	- TA Closure Report	
Activity 5.1: Redact a detailed manual on the use and maintenance of the technology	Number of deliverables	1 x O&M Manual is developed and (if required by SWG translated into x 3 local languages) and delivered to the system users.	- TA Closure Report	

<b>(A) Outputs and Activities as described in the Response Plan</b>	<b>(B) Indicator</b>	<b>(C) Expected results</b>	<b>(D) Method and frequency for data collection</b>	<b>(F) Comments</b>
Activity 5.2: Organize a learn by doing workshop	Total number of events organized by proponents and implementing partners Number of participants in events	1 x Workshop (≥3 hours) held on site, with 10-20 rice farmers from the county (≥30% are women)	- Minutes of the workshop with pictures and a list of participants disaggregated by gender - TA Closure Report	
Activity 5.3: Organize a stakeholder consultation workshop	Total number of events organized by proponents and implementing partners Number of participants in events	1 x Day Workshop With at least 20 participants including: - youth - women - farmers - other citizens - religious leaders - and traditional leaders.	- Minutes of the workshop with pictures and a list of participants disaggregated by gender - TA Closure Report	
Activity 5.4: Organize a training to Municipal and National officers	Total number of events organized by proponents and implementing partners Number of participants in events	1 x Training session 2 representatives (i.e., 1 x Municipal, 1 x National) from each of the ministries with responsibility for: - Agriculture - Water - Environment.	- Minutes of the workshop with pictures and a list of participants disaggregated by gender - TA Closure Report	
<b>Outcome 6:</b> Formulate an enabling environment roadmap and M&E framework	Number of deliverables Total number of events organized by proponents and implementing partners Number of participants in events	1 x Enabling Environment Roadmap Report ≥2-Hours M&E Framework Training provided 10-20 families in attendance	- Enabling Environment Roadmap Report - TA Closure Report	
Activity 6.1: Design a M&E Framework	Number of deliverables	1 x M&E Excel Framework for the Beneficiaries	- M&E Framework - TA Closure Report	

<b>(A) Outputs and Activities as described in the Response Plan</b>	<b>(B) Indicator</b>	<b>(C) Expected results</b>	<b>(D) Method and frequency for data collection</b>	<b>(F) Comments</b>
Activity 6.2: Formulate an enabling environment roadmap to scale up the use of SPIS	Number of deliverables	1 x Enabling Environment Roadmap Report includes: - Financial - Legal - Institutional components	- Enabling Environment Roadmap Report - TA Closure Report	Dependent on the funding available for its development
Activity 6.3: Organize a workshop with municipal and national officers to present the M&E and enabling environment roadmap	Total number of events organized by proponents and implementing partners Number of participants in events	1 x workshop with 2 representatives (i.e., 1 x Municipal, 1 x National) from each of the ministries with responsibility for: - Agriculture - Water - Environment.	- Minutes of workshop included in Enabling Environment Roadmap Report - TA Closure Report	
Activity 6.4: Train rice farmers on the M&E framework	Total number of events organized by proponents and implementing partners Number of participants in events	≥2-Hours M&E Framework Training provided to owner of pilot SPIS site and farmers (10 participants)	- TA Closure Report	



<b>Impact Statement</b>	
<b>Challenge</b>	Agriculture in Liberia is predominantly rain-fed, so climate change is threatening the sustainability of agricultural production. In response, the Liberian Government is investigating intensified rice farming, to increase rice production, whilst lowering water usage by crop-targeted drip irrigation, thereby ensuring sustainable use of the limited surface and groundwater resources, and reducing the contribution to climate change of electricity generation by pumping systems powered by solar systems.
<b>CTCN assistance</b>	The TA aims to introduce Solar Powered Irrigation Systems (SPIS) technology as part of a System of Rice Intensification (SRI) pilot in one county, using lessons learnt to formulate an enabling environment roadmap and M&E framework for nationwide roll-out; including: <ul style="list-style-type: none"> <li>• Analysis of current irrigation and rice cultivation practices</li> <li>• Design of SPIS technologies for SRI in Bong or Lofa county</li> <li>• Small-scale pilot of the selected SPIS</li> </ul> Dissemination of training materials and workshops.
<b>Anticipated impact</b>	The following anticipated impact indicators will be assessed as a result of the technical assistance: <ul style="list-style-type: none"> <li>• CI 3: Anticipated number of direct and indirect beneficiaries (disaggregated by gender) This will be assessed by the number of participants in the stakeholder engagement, training, and workshops; number of individuals directly benefiting from the pilot SPIS scheme; and the number of individuals indirectly benefiting from the pilot SPIS scheme.</li> </ul>
<b>Anticipated co-benefits from the TA</b>	Apart from the core impact indicators above there are significant co-benefits expected over the project lifetime from the TA and the Team intends to assess and quantify the following: <ul style="list-style-type: none"> <li>• Environmental co-benefits:               <ul style="list-style-type: none"> <li>○ Energy savings</li> <li>○ Reduction of air-pollution</li> </ul> </li> <li>• Social co-benefits:               <ul style="list-style-type: none"> <li>○ Increased knowledge for climate change adaptation and mitigation</li> <li>○ Access to energy and water for rural households, for domestic and livestock use</li> </ul> </li> <li>• Economic co-benefits:               <ul style="list-style-type: none"> <li>○ Increased food security and the improvement of livelihoods of local communities</li> <li>○ Job opportunities within local communities.</li> </ul> </li> </ul>
<b>Gender aspects of the TA</b>	Past experiences show that there are significant benefits of solar pumping solutions for women. It allows the women farmers to become net producers, generate income from market sales and substantially increase their household nutrition intake and food security (Burney et al., 2009). Also, gender characteristics play an important role in terms of energy decision-making (IRENA, 2016). <ul style="list-style-type: none"> <li>• The TA supports achieving gender equality and the empowerment of all women and girls by the inclusion of gender in all the intended outcomes.</li> <li>• A gender analysis will be conducted for stakeholder participation.</li> <li>• The SWG will be gender balanced.</li> <li>• Gender benefits will include identifying and addressing challenges and barriers for women (and youth) in accessing small-scale irrigation systems and solar water pumping in rice cultivation.</li> </ul>
<b>Anticipated contribution to NDC</b>	<ul style="list-style-type: none"> <li>• Through promoting low-emissions rice cultivation, the TA will contribute to Liberia's Nationally Determined Contribution (NDC) to the Paris Agreement by contributing to achieving Liberia's NDC target of reducing agricultural GHG emissions by 40% below projected business-as-usual (BAU) levels by 2030 (reduction of 13 GgCO<sub>2</sub>e)</li> <li>• Supporting the NDC target of deploying "at least 1 solar water pump and/or spring irrigation system for crop irrigation for communal farms with land constraints in each county by 2030".</li> </ul>

Impact Statement	
The narrative story	<p>Agriculture in Liberia is predominantly rain-fed, dependent on consistent rainfall, and climate change is posing serious challenges to the sector by threatening the sustainability of agricultural production in the country. In response, the Government of Liberia is investigating the adoption of irrigation for intensified rice farming, to increase rice yields in the country whilst lowering water usage by applying crop-targeted drip irrigation, thereby ensuring sustainable use of the limited available surface and ground water resources. Also, due to the high cost of electricity, irrigation water pumping is to be powered by solar systems.</p> <p>The objective of the TA is to introduce solar powered irrigation technology and practices to intensify rice cultivation and production in one lowland county in Liberia, to be selected between Lofa and Bong, with the intention of upscaling the technology as an adaptation measure to climate change at a national level. To achieve this objective, the TA shall:</p> <ul style="list-style-type: none"> <li>• Analyze the current irrigation and rice cultivation practices in one county of Liberia</li> <li>• Design appropriate irrigation and solar water pumping technologies for SRI based farming in the selected county</li> <li>• Select an appropriate SPIS technology</li> <li>• Pilot a small-scale implementation of the solar pumping system in the selected county</li> <li>• Elaborate and disseminate training materials and workshops</li> <li>• Formulate an enabling environment roadmap and a M&amp;E framework.</li> </ul>
Contribution to SDGs	<p>The TA is expected to contribute to the following Sustainable Development Goals (SDGs):</p> <ul style="list-style-type: none"> <li>• SDG1 End poverty in all its forms everywhere <i>Improving rice production through the System of Rice Intensification (SRI) and Solar Powered Irrigation Systems (SPIS) will increase incomes for rural farmers.</i></li> <li>• SDG2 End hunger, achieve food security and improved nutrition, and promote sustainable agriculture <i>Improving rice production through SRI and SPIS will ensure food security and improved quality of life for farmers.</i></li> <li>• SDG7 Ensure access to affordable, reliable, sustainable, and modern energy for all <i>By promoting the roll out of SPIS, the TA is improving the availability of affordable, reliable, sustainable, and modern energy and increasing the share of renewable energy produced.</i></li> <li>• SDG13 Take urgent action to combat climate change and its impacts <i>By replacing inefficient old pumps powered by fossil fuels with PV solar power, CO<sub>2</sub> emissions will be reduced, energy savings will be made and air pollution avoided. SRI initiatives and SPIS infrastructure will provide resilience to climate change impacts of drought, increased temperatures, wind and consecutive dry days. Direct and indirect beneficiaries will benefit from enhanced awareness and knowledge and an enabling environment roadmap for nationwide implementation.</i></li> </ul>

Note: The information in the table above will be used by the CTCN for public communication of the achieved and expected results of the Technical Assistance through the CTCN website [www.ctc-n.org](http://www.ctc-n.org) and other communication channels. See for example: [https://www.ctc-n.org/sites/www.ctc-n.org/files/benin\\_ag\\_forestry.final.pdf](https://www.ctc-n.org/sites/www.ctc-n.org/files/benin_ag_forestry.final.pdf)