Technology concept submission form

Guidelines:

- Technology concept submission form should be completed by an applicant organisation in collaboration with the national focal points to the CTCN (National Designated Entity, NDE) and the Adaptation Fund (Designated Authority) of the country. Please see updated contact list of the NDEs and the Designated Authorities through web-links as below:
  - NDE: http://unfccc.int/ttclear/support/national-designated-entity.html
  - Designated Authority: https://www.adaptation-fund.org/apply-funding/designated-authorities/
- The form must be signed by the NDE before official submission to UNEP-CTCN.
- The form can be submitted as a Word file containing a digital signature or as a signed and scanned PDF file in combination with an un-signed Word file.
- For the technology concept submitted by multiple countries, all the NDEs of the respective countries shall sign identical forms before official submission to UNEP-CTCN.

Country or countries:	Ghana
Title of the technology concept:	Enhancing Climate Resilience in Ghana's Tomato Value Chain Through Scalable Solar-Powered Irrigation and Integrated Financial Solutions for Smallholder Farmers
NDE:	Environmental Protection Authority (EPA) Mr. Joseph Amankwa Baffoe Acting Director Email: jabaffoe@gmail.com Address: No. 91 Starlet Street, Opp. Ghana News Agency M 362 Accra, Greater Accra, Ghana
Applicant:	Environmental Protection Authority(EPA) Dr. Antwi-Boasiako Amoah Acting Director, Climate Vulnerability and Adaptation National Adaptation Plan Project Coordinator Email: aantwib@gmail.com/antwi.boasiakoamoah@epa.gov.gh Address: No. 91 Starlet Street, Opp.GhanaNewsAgency M 362 Accra,

	Greater Accra, Ghana

Geographical scope:

☐ Community level
☒ Sub-national
☐ National
☐ Multi-country

If the technology concept is at a sub-national or multi-country level, please describe specific geographical areas (provinces, states, countries, regions, etc.).

Problem statement related to climate change:

Ghana's agriculture sector, which employs approximately 40% of the national labor force and contributes substantially to gross domestic product, remains heavily dependent on rain-fed farming systems.[1] However, the adverse impacts of climate change, particularly the increasing unpredictability and variability of rainfall, have undermined agricultural productivity and food security. Smallholder farmers, who dominate the sector and produce over 80% of the country's food needs, are highly vulnerable to these changes.[2] About 90% of farm holdings in Ghana are less than 2 hectares in size, resulting in small-scale, subsistence farming, with the majority relying on rainfall.[3] This vulnerability is particularly acute in semi-arid northern Ghana, where over 80% of the population depends on agriculture for livelihoods, and rain-fed systems.[4]

Ghana's Fourth National Communication to the United Nations Framework Convention on Climate Change (UNFCCC) projects that temperatures are likely to increase by 3.9°C by 2080 under high-emission scenarios, with savanna regions experiencing even greater rises.[5] These changes will shorten the wet season, increase rainfall intensity (heightening flood risks), and extend dry periods, heatwaves, and potential evapotranspiration. Consequently, water availability for agriculture will decline, reducing productivity and exacerbating food shortages for smallholder farmers. A study by the International Food Policy Research Institute indicates a potential yield decrease of up to 25% for main rain-fed crops such as maize, rice, and groundnuts by 2050 without adaptation measures.[6] However, with interventions like improved irrigation, yields could be sustained or increased.

One of the most affected areas is the tomato value chain, where inconsistent rainfall patterns and insufficient irrigation infrastructure have led to declining yields and income instability. Tomato cultivation requires consistent and reliable water supply, yet most smallholder farmers operate in areas with minimal or no irrigation facilities. Climate shocks, such as droughts, have caused severe

[1] Employment in agriculture (% of total employment) (modeled ILO estimate) - Ghana | Data
[2] Yaro, J. A. (2019). The food system of Ghana: A smallholder perspective. Knowledge for Food. https://knowledge4food.net/wp-content/uploads/2019/02/190117-_public-seminar-ghana-foodsystems_ppt-yaro.pdf
[3] Scaling up note: Ghana
[4] Azechum_Aburinya_MASTERS_2017.pdf
[5] Ministry of Environment, Science, Technology and Innovation. (2015). Ghana National Climate Change Policy. Green Policy Platform
[6] Sagoe, R. (2009). Climate change, agriculture, and foodcrop production in Ghana. International Food Policy Research Institute (IFPRI)

yield losses, with up to 35% of farmers in regions like Ashanti reporting full or severe impacts.[7] This climate-induced production shortfall has compelled Ghana to rely heavily on tomato imports, with over 90% of fresh tomatoes sourced from Burkina Faso to meet an annual demand exceeding 800,000 metric tons.[8] Smallholder farmers, who form the backbone of domestic tomato production, often struggle to invest in irrigation due to high upfront costs and limited access to technical and financial support. As a result, they are increasingly abandoning tomato cultivation for less vulnerable but lower-value livelihoods.

Solar-powered irrigation systems (SPIS) represent a key adaptation intervention to address water insecurity caused by climate change, buffering the effects of drought and enabling year-round production. SPIS, powered by renewable solar energy, provide reliable and affordable energy for irrigation, especially in remote rural areas lacking grid access or affordable diesel, while offering mitigation co-benefits through reduced emissions. However, adoption in Ghana remains limited due to barriers such as uncovered risks, lack of incentives, supply chain gaps, and insufficient capacity among farmers.[9] Aggregating unbanked smallholder farmers through cooperatives is essential to scale SPIS, lower implementation costs, and address financing challenges collectively.

Past and on-going efforts to address the problem:

[7] Hossain, M. S., et al. (2022). Addressing the resilience of tomato farmers in Ghana facing a changing climate. Ecology and Society, 27(3).

[8] Ghana: Tomato imports from Burkina Faso hit US$400 mln annually

[9] Barriers to the uptake of solar-powered irrigation by smallholder farmers in sub-saharan Africa: A review - ScienceDirect

Over the past decade Ghana has advanced multiple public, private, and development-partner initiatives to strengthen climate resilience in agriculture through irrigation and allied services. Under the Adaptation Fund Climate Innovation Accelerator, with support from the Climate Technology Centre and Network (CTCN), Ghana designed and tested SPIS business models and financing structures for smallholders, including community-owned, operator-managed, and shared-ownership variants, alongside implementation guidance and dashboards for tariffing and capital structuring. This prior CTCN assignment also scoped policy measures, proposed national technology standards and certification for SPIS, and outlined training programs and centers of excellence to build confidence among farmers and lenders. Complementary stakeholder consultations, training, and sensitization of high-level staff of the relevant Ministries, Agencies, Financial Institutions, and scoping under the UNEP-supported NDC Action Project anchored SPIS as a national adaptation priority and convened a cross-ministerial working group to steer uptake.[10]

Public irrigation investments have modernized large schemes such as Tono and Kpong under the Ghana Commercial Agriculture Project, expanding irrigable area for smallholders and nucleus farms.[11] Targeted capacity-building has been delivered through GiZ's Green People's Energy program, which trained more than 200 technicians and finance officers, offered results-based subsidies to farmers, and supported the Energy Commission's licensing scheme for solar-pump companies. Research and pilot activities by IWMI mapped national suitability for SPIS and facilitated demand–supply linkages with local distributors in the northern regions, reinforcing practical pathways to scale.[12],[13] On the finance side, Ghana's risk-sharing mechanisms, notably GIRSAL's credit-guarantee and interest-rate subsidy instruments, continue to de-risk agricultural lending for priority value chains.[14]

Despite these efforts, mainstreaming SPIS for smallholders still faces hurdles, up-front costs, limited after-sales service, and fragmented financing, echoing regional evidence on barriers to solar irrigation adoption.[15] Building on the earlier CTCN work, the proposed demonstration will integrate the tested business models with bundled green credit and digital climate insurance, drawing on UNEP's picture-based insurance experience in Uganda, and advance policy and standards to enable responsible, scalable deployment.[16]

Specific technology[17] barriers:

Despite Ghana's growing policy attention and pilots, smallholders still face specific, technology-centred barriers that prevent identification, assessment, and deployment of solar-powered irrigation systems (SPIS) at scale. The proposed demonstration directly complements national

[10] international-climate-initiative.com
[11] World Bank
[12] Solar photovoltaic technology for small-scale irrigation in Ghana: suitability mapping and business models. Agricultural Water Management – Making a Business Case for Smallholders
[13] How solar-based innovations are helping farmers in Africa become water and food secure - IWMI Success Story
[14] Agricultural Credit Guarantee Scheme - GIRSAL: Catalysing Agricultural lending in Ghana
[15] Barriers to the uptake of solar-powered irrigation by smallholder farmers in sub-saharan Africa: A review
[16] How a novel type of insurance is helping Uganda's banana farmers avoid catastrophe
[17] *"**any equipment, techniques, practical knowledge and skills** needed for reducing greenhouse gas emissions and adapting to climate change" (Special Report on Technology Transfer, IPCC, 2000)*

efforts by pairing tested SPIS business models with digital insurance and affordable credit, anchored in organised farmer groups/VSLAs (~1,000 farmers) to create a replicable pathway to scale.

1. **High Upfront Costs of SPIS Equipment, Bankability and cash-flow mismatch for quality SPIS.** Upfront costs for pumps, controllers, and storage exceed typical smallholder cash flow, and credit remains scarce or ill-suited, even as PV prices fall. This is a leading adoption barrier across sub-Saharan Africa.[18] Ghana-specific analyses show SPIS can be financially viable under the right terms, reinforcing the need for fit-for-purpose credit.[19]

   Solution: Structure affordable green credit with the Development Bank of Ghana (DBG) and participating FIs, building a bankable project pipeline as an exit strategy and using our AFCIA/NDC-developed models to set tariffs and tenors.[2021]
2. **Production and lender risk without climate insurance.** Weather shocks and pest/disease risks make lenders cautious and deter farmer investment.[22]

   Solution: Co-design digital picture-based/index insurance with Sanlam, adapting UNEP's Uganda model that automates claims with geo-tagged photos and agronomic advice, improving resilience and bankability.
3. **Design, installation, and after-sales performance gaps.** Mis-sizing, weak installation, and limited O&M degrade performance and farmer confidence. International guidance stresses competent design, training, and service for sustained results.[23]

   Solution: Embed competency-based training, vendor SLAs, and user manuals in each site, tied to our prior CTCN and NDC Action capacity-building recommendations and training toolkits.
4. **Quality assurance and market trust.** Uncertified pumps and thin rural distribution expose farmers to failures. Ghana's Energy Commission now licenses Solar PV Water Pump Service Providers for importation and installation, a strong foundation that needs systematic application to SPIS procurement and enforcement.[24]

   Solution: Adopt pre-qualification and standards aligned to Energy Commission licences, warranties, and maintenance requirements, as recommended in the prior CTCN assignment.[25]
5. **Responsible water use and siting.** Without hydrological assessment and efficient application, SPIS can increase abstraction pressure. Global guidance urges water-use safeguards and farmer training, and Ghana-specific mapping pinpoints where SPIS is suitable and sustainable.

   Solution: Institutionalise site-specific hydro-assessments and GIS-based suitability into screening and design, using IWMI/ILSSI tools to right-size systems and promote efficient irrigation methods.
6. **Fragmented project preparation and weak farmer aggregation.** Many initiatives lack the aggregation needed for bankable systems and reliable O&M.

[18] The Benefits and Risks of Solar Powered Irrigation
[19] Barriers to the uptake of solar-powered irrigation by smallholder farmers in sub-saharan Africa: A review - ScienceDirect
[20] The Case of Tomato in Ghana: Productivity
[21] https://www.hortifresh.org/wp-content/uploads/IFPRI-Competitiveness-Vegetables-Ghana-report-2018.pdf
[22] IPCC_AR6_WGII_Chapter09.pdf
[23] The Benefits and Risks of Solar Powered Irrigation
[24] Solar or Diesel: A Comparison of Costs for Groundwater-Fed Irrigation in Sub-Saharan Africa Under Two Energy Solutions - Xie - 2021 - Earth's Future - Wiley Online Library
[25] https://www.hortifresh.org/wp-content/uploads/IFPRI-Competitiveness-Vegetables-Ghana-report-2018.pdf

Solution: Anchor demonstrations in organised farmer groups/VSLAs, with about 1,000 farmers and basic data available, lowering per-farmer cost and enabling group lending, training, and service logistics.

Sectors:

Please indicate the main sector(s) related to the technology concept:

☒ Agriculture	☐ Coastal zone management	☐ Disaster risk reduction	☒ Food security
☐ Forests	☒ Human health	☐ Marine and fishery	☒ Rural development (resilience)
☐ Urban development (resilience)	☒ Water management		

Please add other relevant sectors:

Cross-sectoral enablers and approaches:

Please indicate the main cross-sectoral enablers and approaches:

☒ Communication and awareness	☒ Economics and financial decision-making	☒ Governance and planning	☒ Community based
☐ Disaster risk reduction	☐ Ecosystems and biodiversity	☒ Gender	

Technology concept requested:

Overall Objective

The overall objective of this technology concept is to strengthen the adaptive capacity, resilience and productivity of Ghana's smallholder tomato farmers by demonstrating and enabling the scale-up of solar-powered irrigation systems (SPIS) as a viable response to climate-induced rainfall variability. Alongside with digital agricultural insurance and bundled green credit solutions. These integrated climate-resilient technology, financial instruments and technical assistance aim to reduce dependence on rain-fed agriculture, offset effects of climate-induced rainfall variability, improve agricultural productivity, and stabilize livelihoods. The technology concept directly supports Ghana's Nationally Determined Contributions (NDCs) and the country's priority Adaptation Actions from the National Adaptation Plan (NAP) while also advancing Sustainable Development Goals (SDGs) related to food security, clean energy, climate action and inclusive economic empowerment.

Building on previous projects:

Recent interventions under the Adaptation Fund Climate Innovation Accelerator (AFCIA) and Nationally Determined Contributions (NDC) Action Projects have demonstrated the technical viability and economic promise of SPIS in enhancing resilience against climate stressors. These initiatives developed business models and created an enabling stakeholder environment for SPIS,

but widespread adoption remains constrained by the need for coordinated support in affordable financing, insurance mechanisms, capacity building, and institutional anchoring with farmer groups/VSLAs. Their main recommendations were that scaling SPIS requires:

1. Affordable and blended financing schemes;
2. Risk-sharing mechanisms such as agricultural insurance;
3. Capacity building for farmers and technicians;
4. Institutional anchoring with farmer groups and village savings and loan associations (VSLAs).

The proposed AFCIA II initiative intends to implement at least three demonstration projects in Ghana's northern and coastal savannah zones, each engaging smallholder farming groups/VSLAs and targeting about 1,000 farmers. By integrating SPIS based on existing business models from the AFCIA and NDC Action Projects, digital agricultural insurance products in collaboration with Sanlam Allianz, and affordable green credit facilities supported by the Development Bank of Ghana and the Green Investment Facility, the projects aim to build a climate-resilient tomato value chain. This integrated approach seeks to attract sustainable private investment and develop a bankable, replicable model that enhances food security and strengthens the adaptive capacity of Ghana's agricultural sector amid climate change. The long-term goal is to establish a sustainable project pipeline as an exit strategy, transitioning from donor-dependent initiatives to economically viable, climate-smart agricultural enterprises.

Anticipated Groups of Activities to be Performed by the Micro-Grants Project

1. **Activity 1: Site Selection and Agro-Technical Assessment:** Conduct site assessments and feasibility studies in three regions of Ghana to evaluate tomato production potential, water availability, farmer organisation, and climate-related risks. In collaboration with the Ministry of Food and Agriculture Crops Department.
2. **Activity 2: System Design and Institutional Anchoring:** Design site-specific solar-powered irrigation systems and implement them through organised smallholder cooperatives to ensure ownership and benefit approximately 1,000 farmers.
3. **Activity 3: Capacity Building and Training Delivery:** Adapt prior CTCN/NDC Action capacity-building and training toolkits and deliver training on SPIS (operation, maintenance, and efficient water use, etc.), use of digital platforms for accessing insurance coverage and claims and financial literacy workshops for farmers, cooperatives, technicians, and extension agents, while providing institutional support to local authorities and community organisations to ensure long-term sustainability.
4. **Activity 4: Development of Bundled Financing and Insurance Solutions:** Collaborate with financial institutions and insurers (Sanlam and the Development Bank of Ghana) to develop accessible credit and index-based insurance products, and pilot bundled SPIS packages that integrate irrigation technology with financial services.
5. **Activity 5: Demonstration of SPIS business models with farmer aggregation:** Deploy and operationalize tested SPIS business models from the prior CTCN assignment, using organised cooperatives/VSLAs to lower per-farmer cost, strengthen O&M, and document performance in tomato systems.
6. **Activity 6: Knowledge Management and Policy Support:** Document implementation outcomes and user feedback to develop best practice guides and prepare policy briefs to support the integration of SPIS into national agricultural and climate adaptation strategies.

Anticipated Products to be Delivered by the Micro-Grants Project:

Activity 1: Site Selection and Agro-Technical Assessment

- **A1.1 Selection framework and screening tools** for tomato hubs in three regions, including criteria, data sheets, and GIS layers (suitability, climate risk, water availability, access).
- **A1.2 Pre-feasibility reports** for shortlisted sites, covering agronomy, farmer organisation profiles, preliminary demand, and environmental and social screening.
- **A1.3 Full feasibility and siting dossiers (per selected site)**: hydro-assessment and water balance, cropping calendars, preliminary system sizing envelope, grid/diesel displacement analysis, and safeguards notes (including water-use safeguards template).
- **A1.4 Consolidated site selection report** recommending final demonstration locations with an implementation roadmap and risk register.

Activity 2: System Design and Institutional Anchoring

- **A2.1 Site-specific SPIS design packages (per site)**: hydraulic design, PV array and pump sizing, storage and distribution layout, efficient irrigation method specification, bill of quantities, and O&M plans.
- **A2.2 Institutional anchoring agreements**: MOUs with cooperatives/VSLAs, FIs, local authorities and other bodies (e.g. providers of ancillary services such as suppliers and aggregators) defining roles, ownership, tariff/fee policies, and service obligations.
- **A2.3 Implementation SOPs and user manuals**: commissioning checklists, preventive maintenance routines, and incident reporting templates.

Activity 3: Capacity Building and Training Delivery

- **A3.1 Competency-based training toolkit**: Adapt and/or refine existing training modules for operators, technicians, extension agents, farmer leaders, and lenders (design basics, O&M, efficient water use, safety) involved in the demonstration projects.
- **A3.2 Training of Trainers (ToT) roll-out** with agendas, curricula, slide decks, and assessment tools; training completion reports with participant lists disaggregated by gender and role.
- **A3.3 Digital literacy and insurance/credit onboarding guides**: step-by-step materials for claims, loan servicing, and record-keeping.
- **A3.4 Help-desk and field support plan**: troubleshooting trees, service-level targets, and escalation pathways.

Activity 4: Development of Bundled Financing and Insurance Solutions

- **A4.1 Credit product blueprints** with Development Bank of Ghana and participating FIs: terms, tenors, grace periods, eligibility, KYC, and repayment aligned to tomato cash flows.
- **A4.2 Prototype digital index/picture-based insurance** with Sanlam: peril definition, triggers, data and photo protocols, claims workflow, and farmer education assets.
- **A4.3 Lender and insurer onboarding protocols**: risk appraisal templates, due-diligence checklists for SPIS projects, and portfolio monitoring dashboards.
- **A4.4 Bundled "SPIS + finance + insurance" package**: integrated customer journey, consent forms, and data-sharing agreements.

Activity 5: Demonstration of SPIS business models with farmer aggregation

- **A5.1 Demonstration implementation briefs (per site)**: selected business model (community-owned, operator-managed, or shared ownership), cost-recovery policy, and governance arrangements.
- **A5.2 Performance monitoring dashboard**: yield, water use, uptime, service tickets, loan status, and insurance metrics; baseline established and first monitoring cycle completed.
- **A5.3 Supplier register and pre-qualification file**: licensed vendors and installers, warranty terms, and SLAs aligned to Energy Commission requirements.
- **A5.4 Farmer aggregation package**: cooperative/VLSA by-laws addenda, aggregation contracts, and template agreements for service fees and asset care.

Activity 6: Knowledge Management and Policy Support

- **A6.1 Best-practice briefs and case studies** from the demonstration sites, including costed do's and don'ts for tomato SPIS.
- **A6.2 Policy and standards notes**: recommendations to operationalise SPIS quality assurance and installer competency within existing Energy Commission and MoFA frameworks.
- **A6.3 Scale-up roadmap and bankable pipeline**: prioritized replication sites, required TA steps, responsible institutions, and a consolidated pipeline dossier for green credit mobilisation.
- **A6.4 Final learning workshop and dissemination pack**: presentations, summary note, media assets, and an open data bundle of non-sensitive tools and templates.

This technology concept aims to overcome key barriers to SPIS adoption, high capital costs, limited technical capacity, and inadequate access to finance and insurance by leveraging past effort successes and engaging organised farmer-based groups/VSLAs. It seeks to establish a replicable, climate-resilient model for year-round tomato production, offering a scalable solution to strengthen Ghana's tomato value chain in the face of climate change.

Expected timeframe:

Phase	Months	Activity focus (A1–A6)	Key tasks	Main outputs / milestones
Mobilisation & Screening	1–6	A1, A3, A4 (+ cross-cutting)	Inception; agree MEL, safeguards, data-sharing; rapid screening across 3 regions; draft selection criteria & GIS layers; start ToT & prepare training toolkits; convene DBG & Sunlam; define briefs for credit blueprints and digital insurance	A1.1–A1.2 screening tools & pre-feasibility notes; draft training toolkit; design briefs for credit & insurance; gender/youth note; stakeholder engagement plan
Feasibility & Preliminary Design	4–8	A1, A2, A4, A6	Full feasibility & hydrology; select 2 demo sites; preliminary engineering & institutional MOUs with coops/VSLAs & local	A1.3 site-selection report; A2 preliminary designs + draft MOUs; A4 draft

			authorities; first drafts of credit terms & insurance triggers; zero-draft policy/standards note; supplier pre-qualification criteria	credit/insurance specs; A6 policy/standards zero-draft
Detailed Design & Anchoring	7–11	A2, A3, A4, A5	Detailed SPIS design packs (hydraulics, PV/pump sizing, BoQ, O&M); commissioning SOPs & user manuals; operator/technician trainings; demo model briefs (governance, cost-recovery); supplier register & SLAs; configure portfolio dashboards	A2.1 design packages; A3 ToT roll-out; A5.1 demo briefs; A5.3 supplier register & SLAs; A4 dashboards ready
Commissioning Support & 1st Monitoring	10–12	A5, A3, A6	Commissioning & operationalisation support for partner-financed demos; establish baseline; activate M&E dashboards; refresher clinics (efficient water use, diagnostics, digital claims/loans); draft case studies & best-practice briefs	A5.2 baseline + dashboards live; A3 refresher sessions; A6 draft case studies/briefs
Optimisation & Scale-up Prep	13–15	A5, A4, A6	First performance review (yield, water use, uptime, tickets, loan status, insurance KPIs); iterate credit & insurance parameters; finalise lender/insurer onboarding protocols; draft scale-up roadmap & bankable pipeline dossier; consultative clinic on policy/standards	A5 performance report; A4 onboarding protocols; A6 draft scale-up roadmap & pipeline dossier; revised policy/standards note
Consolidation & Handover	16–18	A6, A3, All	Final case studies, policy briefs, standards guidance; national dissemination workshop; ToT handover/institutionalisation plan (MoFA/GIDA); final M&E & lessons learned; deliver open, non-sensitive tools/templates	A6 final knowledge pack & workshop; A3 institutionalisation plan; final M&E report; Outcome: demos anchored in organised groups reaching ~**1,000 farmers**; finance/insurance mechanisms ready for scale-up via DBG & Sunlam

Anticipated gender and other co-benefits from the technology concept:

Activities with explicit gender linkages

- **Inclusive targeting and outreach.** Work through women's groups, VSLAs and cooperative leaders to recruit beneficiaries, set participation targets for women and youth in each site, and schedule trainings at convenient times with on-site childcare and travel stipends, so women can attend without added burden.
- **Gender-responsive training and roles.** Deliver competency-based modules for women pump operators, cooperative treasurers and technician apprentices, including digital literacy for loan servicing and insurance claims, and establish grievance and feedback channels that are safe and accessible to women. This responds to evidence that women's access to motorized pumps lags behind men in Ghana and Zambia unless programmes address practical constraints.[26]
- **Insurance and credit that work for women.** Co-design bundled products with simplified onboarding, alternative KYC and group collateral options, plus picture-based claims that can be filed via basic smartphones and champion users. A recent UNEP pilot in Uganda (within the framework of the NDC Action Project) trained 930 farmers, nearly half women, to use picture-based insurance, improving access and speeding payouts.[27]
- **Gender-sensitive M&E.** Track participation, roles, time savings, crop income, claims filed and approved, and decision-making in cooperatives, all disaggregated by sex and age, and publish lessons for national replication.

Anticipated gender co-benefits

- **Time savings and reduced drudgery.** Reliable on-farm water access reduces the need for women and girls to haul water, freeing time for income, education and care. Global guidance on solar irrigation underscores these time and safety benefits when systems are sited close to plots and paired with training.[28]
- **Greater control over production and income.** Small-scale irrigation is associated with higher yields and more resilient incomes, but women often face barriers to adopting motorized technologies. By aggregating women within cooperatives, offering tailored finance, and training women into operator and financial roles, the project is designed to narrow those gaps.[29]
- **Improved financial inclusion and risk protection.** Digital, low-cost insurance linked with credit helps women invest with confidence and recover faster after-shocks, which evidence from Uganda suggests is feasible with picture-based claims and peer support.
- **Health and safety.** Displacing diesel pumping cuts local air pollutants and noise around homesteads and fields, which benefits women and children who spend more time near the farmstead.[30]

Other co-benefits

- **Climate mitigation and energy security.** Replacing diesel pumping with solar reduces lifecycle emissions and operating costs, which strengthens farm margins and reduces exposure to fuel price spikes. Studies attribute the majority of irrigation-related emissions globally to

[26] Gender-equitable pathways to achieving sustainable agricultural intensification
[27] How a novel type of insurance is helping Uganda's banana farmers avoid catastrophe
[28] The Benefits and Risks of Solar Powered Irrigation
[29] How a novel type of insurance is helping Uganda's banana farmers avoid catastrophe
[30] Picture-based-insurance for Climate Resilience - UNEP-CCC

groundwater pumping, with diesel a dominant source, while LCAs show clear advantages for solar pumps over diesel.[31]

- **Water efficiency and resource stewardship.** Designs will right-size pumps, promote efficient application, and adopt water-use safeguards, which lowers pressure on surface and groundwater during dry spells. International guidance emphasises pairing SPIS with training and governance to avoid over-abstraction risks.[32]
- **Economic resilience and value-chain stability.** Year-round irrigation supports steadier tomato supply for markets and processors, improves labour productivity, and creates dignified local jobs for youth as installers, operators and service providers. SPIS briefs highlight income gains and gender equity co-benefits when combined with training and finance.[33]
- **Institutional capacity and standards.** The project leaves behind trained technicians, pre-qualified suppliers and practical guidance that national actors can use to scale responsible SPIS deployment, aligning with earlier CTCN recommendations on training and quality assurance in Ghana.

Key stakeholders:

As part of the previous CTCN assistance and the NDC Action Project, an extensive list of stakeholders have already been consulted, and a Policy Working Group for SPIS has been established for the country. The key stakeholders, including financial institutions are keen to collaborate with the Government of Ghana on this opportunity. This initial set of stakeholder consultations will provide a head- start and advantage to this assignment. A list of the key stakeholders is available in Annex A, along with contact persons and details. The main stakeholder groups are listed below.

Stakeholders	Role to support the implementation of the micro-grants project
National Designated Entity (NDE): Environmental ProtectionAuthority (EPA)	Overall stewardship and NDE sign-off; convene the inter-ministerial Policy Working Group; ensure alignment with NDC/NAP/REMP/FGP; quality assurance of deliverables; official reporting to CTCN.
Request Applicant: Environmental Protection Authority (EPA)	Day-to-day coordination and fiduciary oversight; procurement of experts; coordination with regions/districts; M&E consolidation; knowledge management and dissemination.
Ministry of Environment, Science, Technology and Innovation	To promote and oversee sustainable environmental management and the adoption and application of science and technological innovations through the formulation of policies, monitoring and evaluation of the implementation of sector plans, programmes, and projects for national development.
Ministry of Food and Agriculture (MoFA)	Policy lead for agriculture; nominate focal districts and farmer groups; integrate TA outputs into Feed Ghana Programme; supervise extension and ToT rollout.

[31] Life Cycle Assessment of Diesel Fuel and Solar Pumps in Operation Stage for Rice Cultivation in Tanta, Nile Delta, Egypt - ScienceDirect

[32] The Benefits and Risks of Solar Powered Irrigation

[33] ILSSI-Brief-Solar_082223-150.pdf

Ghana Irrigation Development Authority (GIDA)	Co-lead site screening and hydro-assessments; review SPIS designs; develop O&M and water-use safeguards; advise on scheme governance with cooperatives.
Crops Department (MoFA)	Field coordination in the three assessed regions; farmer-group profiling and aggregation; support baseline data collection and performance monitoring.
Energy Commission / Ministry of Energy	Apply licensing for Solar PV Water Pump Service Providers; advise on standards, warranties and SLAs; support supplier pre-qualification and market QA.
Ministry of Finance (incl. GCF NDA Office)	Policy/finance alignment; link TA outputs to public programmes and green facilities; facilitate engagement with DBG and PFIs.
National Development Planning Commission (NDPC)	Mainstream lessons into district Medium-Term Development Plans; ensure coherence with NAP processes and national planning guidelines.
Development Bank Ghana (DBG)	Co-design affordable credit blueprints for SPIS; due-diligence templates; portfolio monitoring dashboards; curate a bankable pipeline for scale-up via PFIs.
Sanlam (insurance partner)	Co-design and pilot digital index/picture-based insurance; define triggers, data and claims workflows; train agents/aggregators; consumer education.
GIRSAL	Partial credit guarantees/interest support where applicable; lender training on SPIS appraisal; risk-management protocols for PFIs.
Licensed SPIS suppliers & installers (pre-qualified)	Detailed engineering, installation QA, commissioning support; warranties and after-sales service under SLAs; inputs to user manuals and training.
Farmer cooperatives / VSLAs / women's groups	Anchor demonstrations; organise O&M committees and fee collection; participate in training and digital onboarding for finance/insurance; feedback for learning.
District Assemblies & Department of Agriculture (district level)	Local permitting and community engagement; extension support; grievance redress; tracking of social/gender indicators.
Universities/Technical institutions (e.g., UENR; technical universities)	Adapt/refine competency-based curricula; deliver ToT for technicians/extension; support lab testing, diagnostics and learning documentation.
Knowledge partners (Where relevant)	Provide siting/planning tools and peer review of hydro-assessments; advise on M&E design and learning products for replication.
Off-takers/Processors & market aggregators (where relevant)	Signal demand and quality specs; explore MoUs for purchase arrangements; support value-chain integration of demo sites.

Civil society/associations (e.g., FONG; Ghana Agribusiness Chamber)	Community mobilisation; gender and youth inclusion; farmer feedback channels; advocacy for standards and consumer protection.
CTCN-selected Implementing Partner(s)	Technical delivery of the assistance; coordination of expert inputs; safeguards, MEL, and quality assurance; handover of toolkits and guidance to national actors.

Alignment with national priorities: *Please describe how the technology concept is consistent with national climate priorities such as: Nationally Determined Contribution, national development plans, poverty reduction plans, Technology Needs Assessments, Technology Action Plans, National Adaptation Plans, sectorial strategies and plans, etc.*	
Reference document (please include date of document)	**Extract** (please include chapter, page number, etc.).
Nationally Determined Contribution (Updated NDC, 2021)	Annexe 2: Adaptation & Mitigation Contribution Table (pp. 25–26): priorities include Integrated water resources management and Build resilience and promote livelihood opportunities for youth and women in climate-vulnerable agriculture landscapes and food systems—directly consistent with SPIS for smallholders. Section 4.4 (p. 10–11): underscores technology and capacity needs to implement 47 measures.
Technology Needs Assessment	The CTCN documents look at the need for climate innovation in the agriculture sector to address climate change impacts. • CTCN. 2012.Technology Needs Assessment report - Ghana. Pp 33 • CTCN. 2013.Report on Barrier Analysis and Enabling Framework For Diffusion of Prioritized Adaptation Technologies in the Water and Agriculture Sectors.p 43 • CTCN. 2018. Climate Change, Innovations and Syecomp. 2018. These documents provide the context for irrigation in Ghana, and the barriers to climate technologies for irrigation. • Regassa E. N, Horowitz L., Nyamadi B. and Barry B. (2011). Irrigation Development in Ghana: Past experiences, emerging opportunities, and future directions. Ghana Strategy Support Program (GSSP) Working Paper No. 0027. 43p • Boldt, J., I. Nygaard, U. E. Hansen, S. Trærup (2012). Overcoming Barriers to the Transfer and Diffusion of Climate Technologies. UNEP Risø Centre, Roskilde, Denmark, 2012. 130 p. • NWP (2007). National Water Policy. Government of Ghana Ministry of Water Resources, Works and Housing, 2007. 64p
National Adaptation Plans	These documents clearly indicate the impacts of climate change to water availability, low agricultural productivity and outdates practices,

	leading to an increase in food insecurity, and the focus of the Government of Ghana in addressing these issues. The National Climate Change Policy (particularly sections 4.1 and 4.2 on agriculture and food security, and natural resources, provides the policy framework under which technology solutions for solar powered irrigation systems can be considered. The National Adaptation Strategy provides the context for support vulnerable farming groups within the context of climate change impacts, lack of credit facilities, increasing shortages of food, and decreasing productivity amoungst other exacerbating factors for poverty and food insecurity in Ghana. • Environmental Protection Agency (EPA) in partnership with the National Development Planning Commission and the Ministry of Finance. 2012. Ghana's National Adaptation Plan Framework. • Government of Ghana. 2012. National Climate Change Adaptation Strategy • Ministry of Environment Science, Technology and Innovation, Government of Ghana. 2013. National Climate Change Policy.
Add others here as relevant	The documents listed below provide the context of climate related impacts to agriculture – including water scarcity – and the need for climate smart solutions to address productivity issues for smallholder farmers. • Akrofi-Atitianti, F., Ifejika Speranza, C., Bockel, L. and Asare, R., 2018. Assessing climate smart agriculture and its determinants of practice in Ghana: A case of the cocoa production system. Land, 7(1), p.30. • Anuga, S.W., Gordon, C., Boon, E. and Surugu, J.M.I., 2019. Determinants of Climate Smart Agriculture (CSA) Adoption among Smallholder Food Crop Farmers in the Techiman Municipality, Ghana. Ghana Journal of Geography, 11(1), pp.124-139. • Benefoh, D.T. and Ackom, E., 2016. Energy and low carbon development efforts in Ghana: institutional arrangements, initiatives, challenges and the way forward. Aims energy, 4(3), pp.481-503. • Essegbey, G.O., Nutsukpo, D., Karbo, N. and Zougmoré, R., 2015. National climate-smart agriculture and food security action plan of Ghana (2016-2020). CCAFS Working Paper, (139). • Ministry of Environment, Science, technology and Innovation (MESTI), Government of Ghana (2016). Ghana's Low Carbon Development Strategy (LCDS). UNEP DTU Partnership, UNEP, Facilitating Implementation and Readiness for Mitigation (FIRM) Ghana. • Ministry of Environment, Science, technology and Innovation (MESTI) Government of Ghana (2012). Technology Needs Assessment Report – Ghana. Global Environment Facility (GEF)

	and implemented by theUnited Nations Environment Programme (UNEP) and the UNEP-Risoe Centre (URC) • National Development Planning Commission, Government of Ghana(2017). Long-term National Development Plan for Ghana (2018-2057). • Ministry of Food and Agriculture (MoFA) (2018). Agriculture in Ghana. Facts and Figures 2018; Statistics, Research and Information Directorate. • Ministry of Food and Agriculture (2015). Agricultural Sector Progress Report. This document provides information on some of the previous donor initiative on (solar) irrigation. • JICA (2006). A Study of the Effectiveness and Problems of JICA's Technical Cooperation from a Capacity Development Perspective: Chapter 1 Historical Changes in Technical Cooperation Provided to Ghana's Irrigated Agriculture Sector. This document provides information on smallholder farmers in Ghana, and their specific circumstances. • Jordan Chamberlin; International Food Policy Research Institute (IFPRI) (2007). Defining smallholder agriculture in Ghana: who are smallholders, what do they do and how are they linked with markets? These documents provide an investment-focused framework to scale Renewable Energy, including decentralised/off-grid applications and capacity building; long-term targets to 2030—provides enabling policy context for solar pumping in agriculture: • Renewable Energy Master Plan (REMP, 2019) • National Energy Policy (2021)

Development of the technology concept:

The request was initiated by the Environmental Protection Agency (EPA), Ghana's National Designated Entity (NDE) to the CTCN and UNFCCC focal point, as an integrated exit strategy for the NDC Action Project and the CTCN/AFCIA project (AF-2021000106). Both projects, led by EPA, focused on upscaling solar-powered irrigation systems (SPIS) for climate adaptation in agriculture. Recognizing synergies, such as AFCIA's business models and NDC Action's policy portfolios and financial frameworks, EPA proposed this demonstration project to implement outcomes, secure climate funds, and transition to sustainable, private-sector-driven models. Dr. Antwi-Boasiako Amoah, Deputy Director and National Adaptation Plan Coordinator at EPA, coordinated the development, with technical assistance from the Regional Centre for Energy and Environmental Sustainability (RCEES) at the University of Energy and Natural Resources (UENR), and the UNEP under the framework of the NDC Action project.

Stakeholder involvement was comprehensive, drawing from deep consultations under both projects. A multi-stakeholder Policy Working Group, established during NDC Action and AFCIA,

included: Ghana Irrigation Development Authority (GIDA) for irrigation expertise; Ministry of Food and Agriculture (MoFA), for agricultural policy and site selection; Ministry of Environment, Science, Technology and Innovation (MESTI) for climate alignment; Energy Commission/Ministry of Energy for renewable energy standards;and Ministry of Finance for fiscal viability; and technical institutions like RCEES and CARES for irrigation development and SPIS design support.

Subsequently, stakeholder outreach included financial and insurance partners to operationalise bundled solutions: engagement with the Development Bank of Ghana (DBG) on green credit lines and with Sanlam on a digital, index/picture-based insurance prototype adapted from UNEP's Uganda model. There were engagements with the horticulture department of MoFA on the selection of the value chain and zones for the demonstration, and obtained a register of FBOs within the selected zones. These consultations confirmed farmer-group anchoring and the two-zone demonstration focus, with at about 1,000 farmers targeted.

EPA's internal review ensured alignment with NDCs and NAP. The NDE, Mr. Joseph Amankwa Baffoe (Acting Director, EPA), approved the request on August 25, 2025, following consensus from the Working Group.

Background documents and other information relevant for the technology concept:

Please list all relevant documents that will help UNEP-CTCN analyse the context of the technology concept and national priorities. Please note that all documents listed/provided should be mentioned in the technology concept in the relevant section(s), and that their linkages with the technology concept should be clearly indicated. For each document, please provide web-links (if available) or attach to the form. Please add any other relevant information as required.

- Ghana's intended nationally determined contribution (INDC) and accompanying explanatory note. 2015. P. 7, 11, 15
- Environmental Protection Agency [EPA] in partnership with the National Development Planning Commission and the Ministry of Finance. 2012. Ghana's National Adaptation Plan Framework. Government of Ghana. 2012. National Climate Change Adaptation Strategy
- Ministry of Food and Agriculture (MoFA) (2018). Agriculture in Ghana. Facts and Figures 2018; Statistics, Research and Information Directorate.
- Ministry of Food and Agriculture (2015). Agricultural Sector Progress Report.
- CTCN. 2012.Technology Needs Assessment report - Ghana. Pp 33
- Government of Ghana. 2020. Ghana. National communication (NC). NC 4.https://unfccc.int/ttclear/misc_/StaticFiles/
- CTCN. 2018. Climate Change, Innovations and Syecomp. 2018. http://www.agricinghana.com/2018/02/06/climate-change-innovations-and-syecomp
- CTCN. 2013.Report on Barrier Analysis and Enabling Framework For Diffusion of Prioritized Adaptation Technologies in the Water and Agriculture Sectors.p 43
- Akrofi-Atitianti, F., Ifejika Speranza, C., Bockel, L. and Asare, R., 2018. Assessing climate smart agriculture and its determinants of practice in Ghana: A case of the cocoa production system. Land, 7(1), p.30.
- Anuga, S.W., Gordon, C., Boon, E. and Surugu, J.M.I., 2019. Determinants of Climate Smart Agriculture (CSA) Adoption among Smallholder Food Crop Farmers in the Techiman Municipality, Ghana. Ghana Journal of Geography, 11(1), pp.124-139.

- Benefoh, D.T. and Ackom, E., 2016. Energy and low carbon development efforts in Ghana: institutional arrangements, initiatives, challenges and the way forward. Aims energy, 4(3), pp.481-503.
- Essegbey, G.O., Nutsukpo, D., Karbo, N. and Zougmoré, R., 2015. National climate-smart agriculture and food security action plan of Ghana (2016-2020). CCAFS Working Paper, (139).
- Ministry of Environment, Science, technology and Innovation (MESTI), Government of Ghana (2016). Ghana's Low Carbon Development Strategy (LCDS). UNEP DTU Partnership, UNEP, Facilitating Implementation and Readiness for Mitigation (FIRM) Ghana.
- Ministry of Environment, Science, technology and Innovation (MESTI) Government of Ghana (2012).Technology Needs Assessment Report – Ghana. Global Environment Facility (GEF) and implemented by the United Nations Environment Programme (UNEP) and the UNEP-Risoe Centre (URC)
- National Development Planning Commission, Government of Ghana (2017). Long-term National Development Plan for Ghana (2018-2057).
- JICA (2006). A Study of the Effectiveness and Problems of JICA's Technical Cooperation from a Capacity Development Perspective: Chapter 1 Historical Changes in Technical Cooperation Provided to Ghana's Irrigated Agriculture Sector
- Jordan Chamberlin; International Food Policy Research Institute (IFPRI) (2007). Defining smallholder agriculture in Ghana: who are smallholders, what do they do and how are they linked with markets?
- Energy Commission – Licence Guidelines for Solar PV Water Pump Service Providers (2023) — importation; installation & maintenance. Links: EC site (guidelines page + direct PDF

Consultation with the Designated Authority of the country:

Please indicate whether the technology concept has been developed in consultation with the Designated Authority of the country.

☒ The Designated Authority of the country has been engaged in the design of the technology concept and will be involved in the further process leading to the implementation of the micro-grants project.

Monitoring and evaluation:

By signing this form, I affirm that processes are in place in the country to monitor and evaluate the micro-grants project funded by the Adaptation Fund through UNEP-CTCN. I understand that these processes will be explicitly identified in the Project Concept Note (response plan of the micro-grants project) and that they will be used in the country to monitor the implementation of the micro-grants project.

I understand that, after the completion of the micro-grants project, I shall support UNEP-CTCN efforts to measure the success and effects of the support provided, including its short, medium and long-term impacts in the country.

Signature:

NDE name:	Joseph Amankwa Baffoe
Date:	30th September, 2025

Signature:	

THE COMPLETED FORM SHALL BE SUBMITTED THROUGH A WEB-LINK AS BELOW:

https://www.ctc-n.org/adaptation-fund-climate-innovation-accelerator-afcia-unep-ctcn

UNEP-CTCN is available to answer all questions and provide guidance on the application process.

Annex A

The list below provides stakeholders that were consulted. Note that not all relevant stakeholders are in this list, as some were not available:

No.	Stakeholder	Contact person	Contact details	Position
Government Institutions				
1	Ministry of Environment, Science, Technology & Innovation (MESTI)	Dr. Peter Dery	0243646749 / peterjdery@yahoo.com	Director of Environment
2	MESTI	Isaac Dakurah	isaac.dakurah@mesti.gov.gh	Officer
3	Environmental Protection Authority (EPA)	Dr. Daniel Benefoh	0246114652 / dbenefor2000@gmail.com	UNFCCC Focal Point
4	EPA	Dr. Antwi-Boasiako Amoah	0243987871 / aantwib@gmail.com	NAP Focal Point
5	National Development Planning Commission (NDPC)	Dr. Felix Addo-Yobo	0505093954 / yobo@ndpc.gov.gh	SDG Focal Point
6	Ministry of Food and Agriculture (MoFA)	Mr. Kingsley Amoako	0207411864 / kingkwaw@yahoo.com	Climate Change Focal Point

7	MoFA – Crop Services Directorate	Esther Agyekum	23345629758 / esther.agyekum@mofa.gov.gh	Deputy Director, Commodity Lead (Vegetables), Technical Lead Tomato (HAPPY Project)
8	MoFA – Crop Services Directorate	Nathanael Nii-Odai Laryea	0546331820 / niiodailaryea@gmail.com	Officer
9	MoFA – Crop Services Directorate	Edwina Quist	0558869014 / quistedwina@gmail.com	Officer
10	Ghana Irrigation Development Authority (GIDA)	Ing. Theophilus Francis Koffitio	0243218661 / theophilus.kofitio@gida.gov.gh	Senior Irrigation Engineer
11	GIDA	Prosper Glitse	0203783444 / prosper.glitse@gida.gov.gh	Senior Agro-Economist
12	GIDA	Mavis Baah-Acheamfuor	0249441114 / maysamabakah@gmail.com	Environmental Health Safety Specialist
13	GIDA – Aveyime Scheme (V/R)	Bright Kwame Asante	0200222564 / asantebrightkwame@gmail.com	Scheme Officer
14	GIDA – Central Region Scheme	Ebenezer Kwami	0244799997 / kwami.ebenezer@gida.gov.gh	Scheme Officer
15	GIDA – Volta Region Scheme	Samuel Debrah	0242933133 / drebsee@gmail.com	Scheme Officer
16	GIDA – Dawhenya Scheme (Greater Accra)	Timothy Nuwordu	0244406890 / tyaws@yahoo.com	Scheme Officer
17	GIDA – Michel Camp Scheme (Greater Accra)	William Sebuabe	0243651433	Scheme Officer
18	Ghana Standards Authority (GSA)	Prof. Alex Dodoo	0244281927 / gsanep@gsa.gov.gh	Director General

19	GSA	Ing. Francis Akpaloo	0208840565 / francis.akpaloo@gsa.gov.gh	Senior Officer
20	Energy Commission	Fred Ken Appiah	0248007200 / appiahfk@energycom.gov.gh	Deputy Director, Renewable Energy Regulation
21	Energy Commission	Julius Nkansah-Nyarkoh	0546995989 / jnkansah-nyarkoh@energycom.gov.gh	Senior Manager, Renewable Energy Regulations
22	Energy Commission	Kwasi Akuffo	0249708726 / kakuffo@energycom.gov.gh	Senior Officer for Renewable Energy
23	Energy Commission	Ebenezer Ashie	0557349004 / eashie@energycom.gov.gh	Project Coordinator, SUNREF/Green Projects Financing & Investment
Academic and Research Institutions				
24	University of Energy & Natural Resources (UENR)	Prof. Eric Ofosu Antwi	0208812106 / ericofosuantwi@gmail.com	Researcher (Water Resources Engineering)
25	University of Energy & Natural Resources (UENR)	Prof. Samuel Gyamfi	0247194991 / Samuel.gyamfi@uenr.edu.gh	Researcher (Renewable Energy)
26	University of Ghana (Climate Change Centre)	Eric Nordjo	0543051966 / enordjo@st.ug.edu.gh	Researcher (Climate Change)
27	Integrated Water Management (IWMI)	Dr. Olufunke Cofie	024 474 1703/ 054 011 3517/ o.cofie@cgiar.org	Africa Director for Research
Financial Institutions				
28	Agricultural Development Bank (ADB)	Kwame Asiedu Attrams	0244281927 / kattrams@agricbank.com	Head, Agribusiness Desk
29	ADB	Eddie Babalola	0269330738 / ebabalola@agricbank.com	Officer

30	GIRSAL	Ernest Tagbotor Kofi Bondzie	0243332400 / ernest.togbotor@girsal.com 0244889006 / kofi.bondzie@girsal.com	Executive Director
31	Association of Rural Banks (ARB Apex Bank)	Gordon Dery	0200222564 / gdery@arbapexbank.com	Head, Business Development
32	ARB Apex Bank	James Arko	0204175911 / jarko@arbapexbank.com	Head of Credit
33	Ghana Association of Banks (GAB)	Lawrence Sackey	0244097255 / lawrence.sackey@gab.com.gh	Officer
34	ECOBANK Ghana	Ekua Akyere Asante-Antwi	0555980824 / eaessien@ecobank.com	Consumer Banking Product Manager
35	Société Générale Ghana	Amin Ibrahim	0204036062	Head, Environment & Sustainability Finance
36	Rural Development Fund (RDF)	Emmanuel Sackey Angela Klufio	esackey@rdfghana.com 0246831124 / eboafo@rdfghana.com	Head, Programmes & Partnerships Head of Investment
Associations				
37	Peasant Farmers Association of Ghana (PFAG)	Wepia Awal Adugwala	0242265313 / wapiaawal@yahoo.com	National President
38	Women in Agriculture Platform (WIAP)	Gilberta Akuka	0246297965 / gilbertaakuka@gmail.com	Member
39	Farmer's Organization Network of Ghana (FONG)	King-David Amoah	0243863567 / kdkamoah@yahoo.com	President

40	Chamber of Agribusiness Ghana (CAG)	Dr. Mensah Christian Sewordor	0546245325 / cmensah37@gmail.com	Officer
Development Organizations and Other Relevant Institutions				
41	Dream Renewables	Samuel Yeboah Barnaby King	0508826784 / el.samuelyeboah@gmail.com +44 7926 572609 / nkorphill@yahoo.co.uk	Co-Director Co-Director
42	Dizengoff Ghana Ltd.	Samuel Abbey	0242144821 / samuel.abbey@dwagh.com	Irrigation Specialist
43	SNV Netherlands Development Organisation	George F. Sarpong	gsarpong@snv.com	Technical Officer
44	GiZ (Green People's Energy Project)	Rafael Wiese	rafael.wiese@giz.de	Program Manager
45	Farm Radio International	Aaron Lenseini Mahamah	0248379903 / amahamah@farmradio.org	Officer
46	INTEGRATION energy & environment	Mohammed Imran	+49 176 8762 8957 / mimran@integration.org	Consultant
47	INTEGRATION energy & environment	Rushabh Jain	+49 (Germany) / mimran@integration.org	Consultant