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

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.

Process for filling in the form:

- The Implementer must identify relevant quantitative and qualitative indicators as specified in the Closure Report. A sub-set of indicators to monitor and assess must be chosen among these.
- The Implementer may also identify other specific, measurable, achievable, relevant, and time-bound indicators suitable to monitor Activities, Outputs and anticipated Outcomes from the technical assistance and add to the M&E Plan and Impact Statement.
- During implementation of the TA or FTA, the Implementer must collect all relevant data as described in the Monitoring & Evaluation Plan. Aggregated data on selected indicators as well as an updated version of the Impact Statement will be presented in the Closure Report at the end of the assistance.

Basic Information	
Title of response plan	**Identification of technical practices for Climate-Smart Agriculture (CSA) in Indonesia**
Technical assistance reference number	**CTCN 22-011**
Country/ countries	**Indonesia**
NDE focal point and organisation	**Directorate General of Climate Change, Ministry of Environment and Forestry Republic of Indonesia**
Sector(s) addressed	**Agriculture**
Technologies supported	**Climate-smart agriculture**
Implementation period and total duration	**9 November 2022 to 29 March 2024 (16.5 months)**
Total budget for implementation	**USD 225,359.00**
Designer of the response plan	**National Research and Innovation Agency (BRIN)**
Implementer of response plan	**DHI A/S**

(A) Outputs and Activities as described in the Response Plan	(B) Indicator	(C) Expected results	(D) Method and frequency for data collection	(F) Comments
Output 1: Map stakeholders and organize an inception meeting				
Activity 1.1: Map stakeholders that are likely to be involved in CSA deployment in Indonesia	Number of stakeholder analysis report	One (1) stakeholder analysis report, including recommendations on a suitable geographical area in Indonesia to contextualise the technological analysis.	• Literature review following the 5W1H approach by national experts. • One (1) introductory workshop with NDE and PP. • Consultations with NDE and PP.	
Activity 1.2: Establish a stakeholder working group	Number of working group members	Up to 10 confirmed working group members, which reflect inclusiveness (including gender)	• Details of the proposed stakeholder working group, with names and contact details of the members, respective institutions, gender, and their roles. • A copy of correspondence to potential members of the working group.	
Activity 1.3: Organize an inception meeting for the stakeholder working group	Number of inception meeting participants	One (1) inception meeting with a minimum of 8 participants	Minutes of the inception meeting including the participants' list.	
Output 2: Identify technologies to support the identification of water content and soil chemistry on agricultural land				
Activity 2.1: Identify existing technologies that provide data on water content and soil chemistry on agricultural land (vidiometry/drone/CCTV, etc.)	• Number of technology review reports • Number of technology fact sheets	• One (1) technology review report detailing the findings related to existing sensor technology, drone technology, satellite imagery technology, and any other relevant technologies. • Minimum of four (4) technology	Literature review on existing technologies that can identify water content and soil chemistry on agricultural land, expert inputs, and working group inputs.	

(A) Outputs and Activities as described in the Response Plan	(B) Indicator	(C) Expected results	(D) Method and frequency for data collection	(F) Comments
		factsheets (for up to four (4) types of technologies)		
Activity 2.2: Produce a feasibility analysis for the technologies	Technology feasibility analysis report.	One (1) technology feasibility analysis report covering technologies identified under the four (4) types of technologies	National expert assessment summarizing the possible barriers, challenges, and bottlenecks with respect to the application of the technologies using literature review, interactions with working group members and other information sources.	
Activity 2.3: Organize a half-day meeting with the stakeholder working group	• Number of meeting participants • Number of technologies prioritized	• 8 working group meeting participants • Max three (3) technologies to be selected priorities for potential future analysis	Minutes of the meeting including a summary from the focus group discussion on the identification of priority technology and technologies to be considered for the design of the system.	
Activity 2.4: Design the macrosystem framework for the selected technology	Draft report on the design of the macro system framework.	One (1) draft report on the macro system framework	Working group inputs, expert inputs, literature review, and project proponent feedback feed into an analysis of two interconnected technologies that are compatible with a system design (i.e., the sensor technology will drive the automatic watering and fertilising).	
Activity 2.5: Organize a virtual half-day meeting with the stakeholder working group	Number of meeting participants	8 stakeholder working group participants.	Minutes of the meeting, including participant list and summary of focus group discussion outcomes.	

(A) Outputs and Activities as described in the Response Plan	(B) Indicator	(C) Expected results	(D) Method and frequency for data collection	(F) Comments
Output 3: Identify technologies for automatic irrigation and fertilizer application and design an integrated system for the suitable conditions as per the geographic location selected				
Activity 3.1: Identify relevant technologies for automatic irrigation and fertilizer application	Number of technology factsheets for automatic irrigation and fertilizer application	Up to three (3) existing technologies that integrate the automation of watering and fertilizing according to land requirements	Literature review, working group discussions, and expert inputs on automatic irrigation and fertilizer application technologies.	
Activity 3.2: Produce a feasibility analysis for the integration of the two systems	A feasibility analysis report (on the integration of the two systems)	One (1) feasibility analysis report including a draft proposed system design and recommendations	Literature review, working group discussions, expert inputs.	
Activity 3.3: Organise a half-day meeting of the stakeholder working group	A half-day virtual meeting with the working group	8 stakeholder working group participants	Minutes of the meeting including participants list and summary from the focus group discussion, feedback and recommendations for the two systems for integration.	
Activity 3.4: Finalize the feasibility analysis for the integration of the two systems	Final report on the design of the fully integrated system (with the technology able to contribute to the reduction or avoidance of Indonesia's CO_2 emissions of up to 2,524 Gg CO2e)	One (1) report describing the architecture of the system, system specifications and operating conditions of the fully integrated technologies.	Analysis based on Activities 3.2 and 3.3, including incorporating inputs from all the stakeholder consultations.	
Output 4: Analyse market potential and cost-benefit of the fully integrated system				
Activity 4.1: Analyse the market potential for the deployment of the fully integrated system	Draft report on the market potential analysis for the deployment of the fully integrated system	One (1) draft report	Market potential analysis from literature and online source review, expert and stakeholder working group inputs.	

(A) Outputs and Activities as described in the Response Plan	(B) Indicator	(C) Expected results	(D) Method and frequency for data collection	(F) Comments
Activity 4.2: Analyse cost-benefit and financing mechanisms for the deployment of the fully integrated system	Draft report on cost-benefit and financing mechanisms	One (1) draft report describing a *minimum* of one (1) financing mechanism	Cost-benefit analysis and financing mechanism study from literature and online source review, expert and stakeholder working group inputs.	
Activity 4.3: One-day in-person stakeholder meeting	In-person meeting with the stakeholder working group	8 stakeholder working group participants	Meeting minutes, participant list and notes on outcomes of the focus group discussions.	Presentation of the final design of the fully integrated system (Activity 3.4) and the findings of the cost-benefits and financing mechanisms analysis (Activity 4.2).
Output 5: Train governmental bodies in the CSA practices and the fully integrated system				
Activity 5.1: Selection of best CSA practices and associated financing mechanisms	One (1) selected fully integrated system and the associated financing mechanisms	One (1) training on the final fully integrated system and the associated financing mechanisms	Consolidated training materials in English and Bahasa Indonesia	
Activity 5.2: Organize a 2-day workshop with the participation of contextual technology suppliers and the stakeholder working group. The workshop will include case presentations and consolidated findings from the technological analysis and	A 2-day in-person workshop with the Government of Indonesia and technological suppliers	• 10 (minimum) government participants and 5 relevant stakeholders to be trained • 5 technology supplier participants (in person or virtual)	Concluding workshop report including participant lists, case presentations and consolidated findings from the technological analysis and associated financing mechanisms, satisfaction survey results, workshop presentations and meeting minutes.	

(A) Outputs and Activities as described in the Response Plan	(B) Indicator	(C) Expected results	(D) Method and frequency for data collection	(F) Comments
associated financing mechanisms. The workshop will take place in person.				

Note: The Response Plan may contain information useful for the section below. The information in the table below 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 and other communication channels. See for example: https://www.ctc-n.org/sites/www.ctc-n.org/files/benin_a_ag_forestry.final_.pdf

Impact Statement	
Challenge	*Climate-smart agriculture (CSA) technologies offer important opportunities for more precise treatment of every part of the land so that it can increase the productivity level of farming while simultaneously decoupling the increase in farming outputs from increase in inputs. This refers both to increase in water and fertilizer applications, with water being particularly important aspect in building climate resilience of farming in Indonesia. Thus deployment of CSA technologies is an important approach for decreasing production costs, reducing water and environmental footprint and building climate resilience.* *However, CSA technology application in Indonesia is still in early-stage development. The implementation and dissemination of this technology are facing several obstacles. Important barriers to implementing CSA technologies in Indonesia include:* - *insufficient of information on CSA options* - *insufficient knowledge and skill to utilize and deploy such technologies* - *lack of public and farming community awareness on CSA* - *insufficient financial support and market opportunities for CSA technologies.* *The lack of knowledge and skill in implementing CSA technology mainly refers to gaps in knowledge on available CSA options CSA technology providers and the technical knowledge on such CSA facility instalment, preparation, application and postproduction maintenance.* *Furthermore, CSA technology application requires a concerted effort of government, investors, and innovative agricultural technology providers to ensure that farms and agricultural operations are introduced and adopt such practices which require the operations to be run very differently. CSA adoption would require adoption of several advancements in technology of farming operations, including sensors, irrigation devices and information technology systems enabling farming and fertilization operations that are controlled automatically and monitored in real-time to adopt to the rapidly changing climate conditions.* *Investment in CSA technology is another important barrier, both in public and private sector. Better understanding of the costs and benefits of implementation and upscaling of such technologies is needed to help advocacy for adoption (and financing) of these technologies.*
CTCN assistance	*This CTCN TA seeks to:* • *Recommend suitable CSA technology that (a) uses sensors that can identify water content and soil chemistry on agricultural land; and (b) deploys automation of watering and fertilizing tools according to land requirements and climate conditions..* • *Provide training in managing and using the fully integrated system to farmers and Government agencies and through that raise awareness and understanding of CSA technologies for agriculture in Indonesia, supported with cost-benefits analyses if its application.*

Anticipated impact	*In long term, it is expected that the outcomes of the TA will help the players of the agricultural sector in Indonesia to:* • *Facilitate the implementation and replication of CSA technologies in Indonesia, supporting the achievement of its National Adaptation Plan (NAP) goals and strategies* • *Contribute to Indonesia's Nationally Determined Contribution (NDC) as agriculture has been earmarked as one of the five sectors prioritized for mitigation and adaptation intervention programmes.*

Anticipated co-benefits from the TA	• *Providing necessary technology, integrated system and cost-benefit analyses to enable small-scale pilot project in the selected area on the ground, when additional funding is available* • *Providing sufficient information on CSA options and their costs to enable further CSA technology pipeline development in the country* • *Improvement in efficiency, effectiveness and productivity in the agriculture production, including efficiency of water and fertilizer use* • *Increased yield through smart technology application, reducing pressures on land expansion and thus reduce the pressures of ecological destruction and loss of biodiversity.*
Gender aspects of the TA	*The issue of gender is considered central to the implementation of this TA project. A national gender expert was engaged in the implementation of the project throughout its full duration. The gender expert participated in project meetings and reviewed key project findings with the focus on ensuring that gender considerations are mainstreamed throughout the full project execution.* *This included gender mainstreaming in following aspects of the TA implementation:* • *Ensuring a gender balance in the implementation team* • *Ensuring gender balance in project activities relating to stakeholder engagement and training /workshops, meetings)* • *Ensuring gender is considered in main outputs and deliverables* • *Reviewing the selected technologies for CSA and providing inputs on gender considerations when it comes to implementation of these technologies* • *Providing training module inputs on gender mainstreaming under output 5 (the capacity development and training activities to the national stakeholders).*
Anticipated contribution to NDC	• *Reduction of GHG emissions in the agriculture sector* • *Mainstreaming of climate resilience agenda into development planning* • *Promotion of climate resilience in the food, water and energy sectors, particularly focusing on food-water-environment nexus* • *Scaling up best practices in innovative climate change mitigation and adaptation efforts, particularly for water and agriculture sectors*
The narrative story	*Climate change poses one of the most serious risks to food and nutrition security in Indonesia, especially for subsistence farming, and by the year 2050, total rainfall in Indonesia is expected to increase on average by nearly 10% from April through June but decrease by 10% to 25% from July through September.* *Climate change will have impacts on food security, environmental degradation and could potentially contribute to increase in poverty and food insecurity. Furthermore, results from a number of studies have indicated that climate change could result in a 9% to 25% reduction in farm-level net revenue in Indonesia in the future.*

	According to the report by the Ministry of Foreign Affairs (2018), climate change will affect water availability and food security through seawater intrusion, reduction of river flow, reduction of rainfall and increase in temperature. All these impacts may then trigger more crop pests and diseases, a higher risk of crop failure, reduction of food production due to climate-related vulnerabilities such as severe floods and droughts, reduction of rice production due to the reduction in the number of cold nights during planting season, harder crops and seeds preservation during unpredicted and sometimes intense rainfall, frequent fluvial flooding, and an increasing number of tropical cyclones (in certain areas of Indonesia). *These findings were supported by Indonesia's National Action Plan for Climate Change Adaptation (RAN-API) or National Adaptation Plan (NAP) which considers agriculture as one of the four priority sectors with potential economic loss from climate change impacts. The NAP reported that the expected total loss to this sector is estimated to be close to IDR 20 trillion in 2024.* *Consequently, the NAP states that climate adaptation strategy within the agriculture sector should include climate-smart agriculture (CSA) as a prospective technology. CSA by definition is "agriculture that sustainably increases productivity, enhances resilience (adaptation), reduces/removes greenhouse gases (GHG) (mitigation) where possible, and enhances achievement of national food security and development goals."[1] A list of technologies for CSA has been pre- identified and approved at the country level.* *One such CSA technology is the smart farming system. The use of smart farming technology in agricultural production is expected to offer great potential for improving efficiency, effectiveness and productivity. However, the application of these smart farming technologies is not fully understood, hampering its wider application and upscaling as one of the solutions to overcome climate change's effect on agricultural production.* *Due to climate change issues, the achievement of climate resilience through the implementation of the National Plan for Climate Change Adaptability will be conducted through the use of geospatial data, information and automation as a part of smart farming practices. This is in accordance with the Ministry of Industry's program "Making Indonesia 4.0" as an integrated roadmap to be implemented for the Industrial Revolution 4.0. The roadmap requires collaborative actions among multiple stakeholders: governmental institutions, associations, industry and academic components.* *In the Mid-Term National Plan 2020-2024, the National Planning Agency (BAPPENAS) stated that one of the objectives of economic resources management strategies is to increase the availability, access and quality of food consumption, maintain the productivity and sustainability of adaptive agricultural resources with regards to climate change, agricultural digitalization, land management and irrigation. It also mentioned the application of advanced technology, especially in relation to Industry 4.0 in some sectors; one of them is for increasing the efficiency, productivity and competitiveness of the agriculture sector. Agriculture 4.0 can play a key part in solving the food scarcity issue.*

[1] https://www.fao.org/climate-smart-agriculture/en/

	The Indonesian government introduced "Smart Farming 4.0" in September 2018. The Indonesian Ministry of Rural Development led the initiative, with a pilot project in Situbondo, East Java. *Agricultural production varies widely across places and climate change affected each area specifically. Therefore, further understanding, identification and dissemination of CSA technology approaches is urgently needed. Indonesian government through The Ministry of Agriculture has published general guidelines for climate change adaptation in the agricultural sector. However, the policy still lacked the details on its operationalization.* *The concept of CSA in Indonesia is still in the formulation process, conducted by the Ministry of Agriculture and CTAT (International Center for Tropical Agriculture), funded by the World Bank. The concept of CSA will be highly relevant for the whole agricultural production system in Indonesia, starting from the value chain, agriculture system, and sensitive geographical areas which are affected by climate factors.* *This technical assistance brough together national experts and institutional working group to increase technical understanding and implementation potential of CSA technologies within the national agricultural sector. It helped to identify potential CSA technologies of relevance in Indonesia, it developed a proposed for an integrated system that could combine smart agricultural elements of irrigation and fertilization and build the national capacity on application of these technologies.* *The TA also produced a cost-benefit assessment of the integrated system and connected national stakeholders with a number of CSA technology providers, to further help bridge gap between the knowledge of the CSA and it's on-the-ground implementation and upscaling (including the costs of that) in the country.* *In addition to the fertigation systems, the CSA assessment took a closer look at the importance of use of information and communication technology systems to connect the various elements of CSA technologies into an integrated system.* *The application of these kinds of ICTs in agriculture, along withs precision agriculture and other CSA methods will be central to building climate resilience and food security in Indonesia.*

Contribution to SDGs	• *SDG 1: End poverty in all its forms everywhere*
	  - *The outcome of the TA will work on improving agricultural practices in Indonesia, which will have a direct impact on food security*
	
	• *SDG 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture*
	  - *The outcome of the TA will work on improving agricultural practices in Indonesia, which will have a direct impact on food security*
	
	• *SDG 5: Achieve gender equality and empower all women and girls*
	  - *Gender is a central element for this TA, which will be mainstreamed in all outputs*
	
	• *SDG 6: Ensure availability and sustainable management of water and sanitation for all*

	- *The technologies include a smart irrigation system that will help improve the use of water in Indonesia* • *SDG 13: Take urgent action to combat climate change and its impacts* - *This TA will help design better climate-smart techniques, that, once implemented, will increase the resilience and adaptive capacities of the country.*
Reference to knowledge products	• *Experiences, Lessons Learned, and Good Practices from GCF and GEF Support for Climate Technologies (TEC Brief #16)* • *Policy brief on enabling environments and challenges to technology development and transfer identified in TNAs, NDCs and CTCN TA (TEC Brief #17)*