Framework Convention on Climate Change

TEC/2024/28/8

Technology Executive Committee

02 April 2024

Twenty-eighth meeting

16–19 April 2024 (19 April TEC-CTCN Advisory Board Joint session)

Updated annotated draft outline of the FAO and TEC knowledge product "Climate Technologies for Agrifood Systems transformation"

Cover note

I. Background

1. As per activity C.1.1 of the TEC rolling workplan for 2023–2027, the TEC, in collaboration with FAO, organized a thematic dialogue on the water-energy-food nexus during the Bonn Climate Conference (SB58) in 2023. Building upon the thematic dialogue, the FAO in collaboration with the TEC, will prepare a knowledge product and organize an event at COP 20.

2. At TEC 27, FAO presented a draft outline of the knowledge product and the TEC provided guidance to the activity group for further work on this matter.

3. The FAO, with input from the activity group, has developed the annotated outline which builds on the guidance at TEC27. The draft annotated outline was shared with the activity group for their review in November 2023 and a meeting was held on 8 February 2024 for further guidance.

4. Based on the guidance from the TEC, a concept note for COP29 event on the findings of the knowledge product will be developed in parallel with preparation of final knowledge product, and will be presented at TEC 29.

III. Scope of the note

5. The annex I to this note includes an annotated outline of the knowledge product "Climate Technologies for Agrifood Systems transformation: Keeping food security and poverty reduction at the forefront" which provides the analytical views on the role of technologies for sustainable agrifood systems' transformation, capacity and financial needs, policy gaps and opportunities, identification of case studies and draft conclusions.

6. Annex II includes the tentative timelines for finalization of the knowledge product.

IV. Possible actions by the Technology Executive Committee

7. The TEC will be invited to consider the annotated outline and provide guidance to FAO and the activity group for further work on this matter, with a view to finalizing the knowledge product by TEC 29 and to launch it at COP 29.

8. As the TEC discusses the annotated outline, it may be helpful to consider the following specific questions:

(a) What would be needed from the international community to address how the NDC and NAP process be used better to reflect climate technology needs?

(b) What are the key policy bottlenecks for climate technology uptake in the agrifood systems?

(c) How can inclusion of various stakeholders be catered for when addressing climate technologies?

Annex I

Climate Technologies for Agrifood System Transformation
Keeping food security and poverty reduction at the forefront
(Draft Title)

Draft Outline, to be posted online on 2 April 2024

Authorship: FAO and UNFCCC TEC with all contributions listed in the acknowledgement section

Draft Outline:

(i) Foreword

A one-page foreword to be jointly prepared by FAO and UNFCCC TEC

(ii) Executive Summary

An overview summary of the report prepared for policy and decision makers based on the report's key findings and conclusions.

1. Introduction

Climate change has become one of the primary global issues, posing a threat to society as a whole and to agrifood systems. The worsening environmental conditions, including higher temperatures, the intensification of extreme weather events, water scarcity, land degradation, rising sea levels, and ocean acidification, have not only affected natural systems but have also had significant impacts on the capacity of agrifood systems to deliver (FAO, 2020). This influence, coupled with the growing global population, presents a challenge to agriculture's ability to ensure food security for the most vulnerable demographic segments. It hinders progress towards eradicating hunger and malnutrition, exacerbating the intensity of food and nutrition crises and poverty, particularly in low-income countries (SOFA, 2016).

As the world moves forward in its fight against poverty, hunger and climate change, agrifood systems will need to play an active part in climate action, both through mitigation and adaptation actions. Agrifood systems are an important source of income and livelihood. In 2019, around 1.23 billion people were employed in agrifood systems (FAO, 2023).

Ensuring economic and social inclusion in transitioning toward climate resilient development pathway will be central to achieving the desired outcomes, through social inclusion and close tracking of vulnerability. As reported in the IPCC AR6, 3.3 billion people globally live in countries classified as very highly or highly vulnerable (Schipper et al 2022)). Climate technologies are a specific enabler of climate actions in agrifood systems.

If current trends of drivers affecting agrifood systems do not change, the sustainability and resilience of agrifood systems will be under threat and food crises are likely to increase in the future. Interconnected socioeconomic and environmental drivers can shape the future of agrifood systems and contribute to determine agrifood systems outcomes. In this setting, technologies function as triggers/accelerators and can enable sustainable agrifood systems' outcomes.

As one of its objectives directly related to agriculture, the Paris Agreement aims to enhance adaptability to changing environmental conditions and mitigate their negative impacts by promoting a climate-resilient approach and low greenhouse gas emissions development that does not compromise food security (Article 2, Paris Agreement). The agreement recognizes that each participating Party has varying capabilities for implementing these approaches to achieve the specified goals. Therefore, each Party is tasked with establishing its own nationally determined contributions (NDCs), which are ambitious targets aimed at responding to climate change within the agreement's scope, with the support of developed country Parties to ensure effective implementation.

Due the complexity of the issues at hand, the Parties to the agreement have also recognized the need for 'integrated, holistic, and balanced non-market approaches' that aim to eliminate poverty and promote sustainable development. Among these approaches, the agreement emphasizes the transfer of technology and notes the crucial role of technologies in achieving ambitious adaptation and mitigation goals. Furthermore, acknowledging the importance of "existing technology deployment and dissemination efforts" the Parties encouraged cooperative action on the development and transfer of technology (Paragraph 2, Article 10, Paris Agreement).

The report will build on previous work of the TEC on agrifood systems and climate change technologies as well as the work of FAO on these themes. The report aims to present an overview of the agrifood systems, climate and technology interlinkages across different components of these systems. It will consider where there are promising areas for climate change technologies to support agrifood system transformation, including both adaptation needs and mitigation potential. Climate technology uptake and inclusion in agrifood system transformation will be essential to achieve poverty reduction targets. In order though to ensure that poverty reduction elements are built into the strategy for climate technology uptake specific attention to inclusion and access for the poor will have to be built into the transformation strategies for the national agrifood systems. In this way, access to climate technology will act both as a driver of transformation and as a driver of improved food security, livelihoods and wellbeing, leading to poverty reduction.

The report will draw attention to capacity needs for technology uptake, implementation and maintenance and institutional needs for technology update both at upper stream and lower stream level. Dimensions of gender, diversity, traditional and indigenous technologies will be covered.

To flesh out and follow on from the conceptual and methodological sectionns, a set of brief descriptions of climate technologies and their potential in agrifood systems from various countries, agricultural sectors and agrifood value chains will be included in the report. These will document a range of experiences and give a global overview of climate change technologies within agrifood systems. The examples of technologies will include both climate change mitigation and climate change adaptation applications. For the selection of the case studies a good balance of regional representation from regions of the world, diversity in stage of agrifood value change, range of sub-sectors (crops, livestock, fisheries, aquaculture, forestry) and stage of the agrifood value chain (production, processing, consumption) and focus (gender, inclusion, traditional versus advanced, nutrition, livelihood, etc.).

The introduction to the report will set the context of climate action in agrifood systems and the role of technologies therein. It will make the case for the specificities of agrifood systems and their importance in the livelihoods of the bulk of the world's poor people, the needs and potential for adaptation and mitigation in the sector and the role of technology therein. A strong focus of the discussion will be on small scale agricultural producers and value chain participants and linkages to the natural environment, with considerations of food security, water security and environmental sustainability.

The section concludes with a brief overview of the role of technologies in the implementation of the Paris Agreement, focussing specifically on NDCs and NAPs and will l also touch upon linkages with the SDGS.

Key references

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Schipper, E.L.F., A. Revi, B.L. Preston, E.R. Carr, S.H. Eriksen, L.R. Fernandez-Carril, B.C. Glavovic, N.J.M. Hilmi, D. Ley, R. Mukerji, M.S. Muylaert de Araujo, R. Perez, S.K. Rose, and P.K. Singh, 2022: Climate Resilient Development Pathways. In: *Climate Change 2022: Impacts, Adaptation and Vulnerability.* Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 2655–2807, doi:10.1017/9781009325844.027.

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Harvesting change: Harnessing emerging technologies and innovations for agrifood system transformation. Global foresight synthesis report.

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2. Climate change technologies for sustainable agrifood systems' transformation

This section aims to set out the context for the role of technologies in supporting agrifood systems' transformation and defining more sustainable solutions, including providing an overview of the key concepts and the landscape in terms of agrifood systems and value chains and technology interlinkages.

Box 1. What is a climate technology?

The Intergovernmental Panel on Climate Change (IPCC 2000) defines technology as 'a piece of equipment, technique, practical knowledge or skills for performing a particular activity'. It is common to distinguish between three different components of technology:

1. *the tangible component, such as equipment and products, i.e. hardware.*
2. *the processes associated with the production and use of the hardware. This comprises know-how (e.g. manuals and skills) and experience and practices (e.g. agricultural, management, cooking and behavioural practices), i.e. software.*
3. *the institutional framework, or organization, involved in the adoption and diffusion process of a technology, i.e. orgware.*

These three components are all part of a specific technology, but the relative importance of each component may vary from one technology to another.

Source: Haselip, J et al. TNA Step by Step. A guidebook for countries conducting a Technology Needs Assessment and Action Plan.Technology Needs Assessment TNA, 2019. UNEP DTU UNEP GEF. Available at: https://tech-action.unepccc.org/tna-methodology/ [confirm correct citation]

This section provides an analysis of the various pathways in which climate change affects the agrifood system and where technologies are important for addressing climate change and supporting climate action. The section will set the scene for understanding how climate technologies can support agrifood system transformation.

Subsections of the chapter:

2.0 Introduction and overview, definition of technology

The section will begin with a short description of the different types of agrifood systems following (Marshall et al 2021, FAO SOFA 2021, FAO SFVC 2024 [1]) making the point that the impacts of climate change and the potential role of technologies depends the specific value chain being considered, the point of intervention and on the typology of the system.

2.1 Agrifood systems and agrifood value chains: context of agrifood systems and what is an agriculture value chain. Stages of agriculture value chains and technology requirements at each step of the value chains. Value chain contextualized to crops, livestock, fisheries, etc.,

[1] Marshall Quinn, Fanzo Jessica, Barrett Christopher B., Jones Andrew D., Herforth Anna, McLaren Rebecca Building a Global Food Systems Typology: A New Tool for Reducing Complexity in Food Systems Analysis Frontiers in Sustainable Food Systems VOLUME=5 2021 URL=https://www.frontiersin.org/articles/10.3389/fsufs.2021.746512 DOI=10.3389/fsufs.2021.746512

Agrifood systems encompass the entire **range of actors** and their **interlinked value-adding activities** in the primary **production** of food and non-food agricultural products, as well as in food storage, aggregation, **post-harvest** handling, transportation, **processing**, distribution, marketing, disposal and **consumption**. Agrifood systems include crop, livestock, fisheries, forestry and aquaculture value chains.

This will include a description of the segments of the agrifood system and how it can be generalized into 3 main categories: production, value chain and consumption. These section of the agrifood system value chain will form the basis to look at climate change technology intervention.

2.2 Concept of climate technology and contextualization to the agriculture value chain and identification of climate technology interventions for agrifood system transformation

This section will build on the Technology Needs Assessment methodology, with a specific contextualization to the agrifood system and the agrifood system value chain components. Climate technology interventions for agrifood systems will be context specific, where the context specificity will be defined by the location, the type and nature of the agriculture value chain being considered, stage of the value chain and climate change objective. The specific context will be dependent on the natural resource context, water security and water availability context, and the social context, including smallholders, women and youth, vulnerable segments of the population and indigenous people.

The agrifood systems and the agriculture value chain entry points will build on SOFA 2021 and FAO 2022. The requirements for the climate technology will be tied to whether the technology is for technology for mitigation and for adaptation.

2.3 Country typologies by value chain stage and technology.

Agrifood systems are varied in key characteristics that drive which climate technologies are appropriate and likely to be successfully adopted. These agrifood system typologies are based on the nature of agricultural production systems, the degree of commercialization, key features of agrifood processing and consumption patterns. This section will describe these factors determining the typology and relation to components of the agrifood system.

2.4 Boxes: focus boxes to highlight key elements in the assessment component

Two specific focus boxes will be included in this section to highlight specific elements that are central to agrifood system transformation. The first box will be on innovation and how climate technology innovation can support agrifood system transformation. The second box will be on water security and how this is key in ensuring that agrifood systems can transform sustainably.

References

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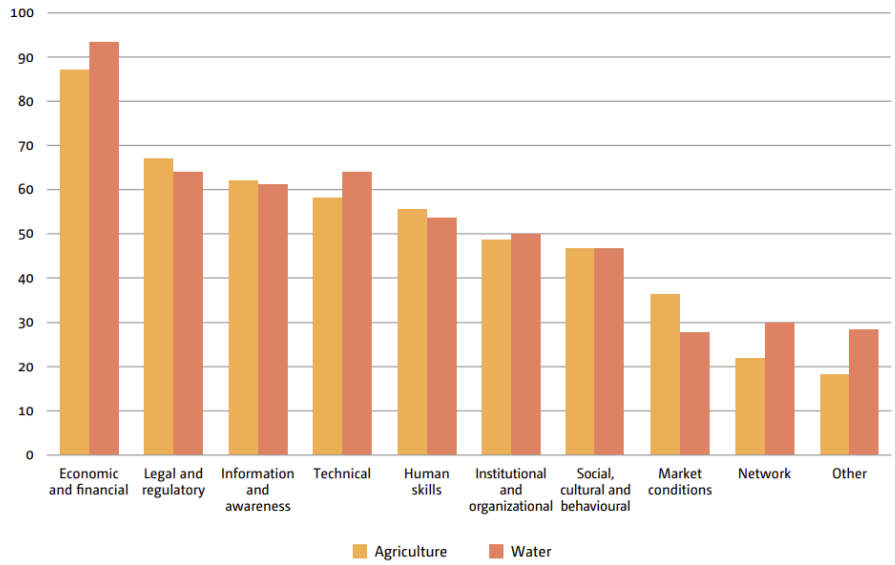
3 Capacity needs and institutional requirements for CC technology deployment

This section aims to set out the capacity requirements within the agrifood system setting to enable scaled up climate change technology uptake. The point of departure will be the CC technologies identified and categorized in the previous section, differentiated by their role in the agrifood system as well as food system typology.

The section starts with a brief description of the socio-economic context in which climate technologies will be implemented. This includes consideration of policy priorities aside from climate related ones, such as embodied in the 17 SDGs. Particular attention will be given to how climate technologies fit into the objectives and means to achieving inclusive food system transformation generating environmental, social and health benefits. This discussion will lead to the elaboration of impact pathways for different types of technologies in different agrifood system contexts, and the nature of accelerators and enabling actions to achieve them. The analysis will use concepts and results from Herrero et a. 2020[2] and Barrett et al 2020[3]. The section will build upon recent TEC work assessing the enabling conditions required for successful deployment of climate technologies (UNFCCC TEC 2022). For example, Figure 10 from that report indicates the type of capacity building most important in creating the enabling environment for adaptation technologies in agriculture and water sectors.

Figure 10 Challenges in the adaptation sectors: agriculture and water



The section then identifies equipment and knowledge requirements associated with a selection of the CC technologies identified in section 3, differentiating between agrifood system types. There are two main types of capacity requirements considered: human capacity (e.g. education and training), equipment and infrastructure (e.g. physical requirements). These will be considered across different segments of the agrifood system (e.g. farmers, processors, transporters, distributors). These results will be synthesized into an assessment of the equipment (hardware) knowledge (software) and institutions (orgware) that are needed to realize the successful adoption of the technologies.

[2] Herrero M, Thornton PK, Mason-D'Croz D, et al. Innovation can accelerate the transition towards a sustainable food system. Nat Food 2020; 1: 266–72.

[3] Barrett CB, Benton TG, Fanzo J, Herrero M, Nelson RJ, Bageant E, Buckler E, Cooper K, Culotta I, Fan S, Gandhi R, James S, Kahn M, Lawson-Lartego L, Liu J, Marshall Q, Mason-D'Croz D, Mathys A, Mathys C, Mazariegos-Anastassiou V, Miller A, Misra K, Mude AG, Shen J, Sibanda LM, Song C, Steiner R, Thornton P, Wood S. 2020. Socio-technical Innovation Bundles for Agri-food Systems Transformation, Report of the International Expert Panel on Innovations to Build Sustainable, Equitable, Inclusive Food Value Chains. Ithaca, NY, and London: Cornell Atkinson Center for Sustainability and Springer Nature.

The section concludes with a discussion on priorities for capacity building and institution building based on the analysis presented.

Subsections of the chapter:

3.1 Socio-economic context of agrifood systems and implications for building enabling conditions for climate technologies

3.2 Accelerators to support the dissemination of climate technologies. This will include a discussion on capacity needs and institutional requirements for effective acceleration across different food system typologies as outlined in section 2.3, touching up human capacity (Education and Training) as well as infrastructure and equipment.

3.3 Conclusions on priorities for capacity development and institution building

References

Herrero M, Thornton PK, Mason-D'Croz D, et al. Innovation can accelerate the transition towards a sustainable food system. Nat Food 2020; 1: 266–72.

Barrett CB, Benton TG, Fanzo J, Herrero M, Nelson RJ, Bageant E, Buckler E, Cooper K, Culotta I, Fan S, Gandhi R, James S, Kahn M, Lawson-Lartego L, Liu J, Marshall Q, Mason-D'Croz D, Mathys A, Mathys C, Mazariegos-Anastassiou V, Miller A, Misra K, Mude AG, Shen J, Sibanda LM, Song C, Steiner R, Thornton P, Wood S. 2020. Socio-technical Innovation Bundles for Agrifood Systems Transformation, Report of the International Expert Panel on Innovations to Build Sustainable, Equitable, Inclusive Food Value Chains. Ithaca, NY, and London: Cornell Atkinson Center for Sustainability and Springer Nature.

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4 Financing needs and requirements for climate change technology update within agrifood systems

This section will review both the estimated financial requirements and potential financing sources for climate technologies in agrifood systems. The estimations will rely on the data available and on key studies available for the sector.

This section will refer to the results of the previous sections in discussing the financial implications of achieving successful uptake of CC technologies in agrifood systems and possible ways of meeting them. The section discusses potential financing opportunities from public as well as private sources and from climate change as well as agrifood system-oriented sources. The chapter concludes with an analysis of key features of business models to support financing and adoption of CC technologies based on case study material.

The section will include a focus box presenting a relevant example on a business case related to climate technology.

Subsections of the chapter:

4.1 Climate finance flows (climate finance for mitigation and adaptation in agrifood systems)

4.2 Financing needs to support climate technology uptake in the agricultural sector based on published information such as UNFCCC NDR report

Focus boxes: Business models to support climate change technologies uptake (depending on data availability).

References

First report on the determination of the needs of developing country Parties related to implementing the Convention and the Paris Agreement, UNFCCC Standing Committee on Finance, https://unfccc.int/sites/default/files/resource/54307_2%20-%20UNFCCC%20First%20NDR%20technical%20report%20-%20web%20%28004%29.pdf

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Climate Policy Initiative. 2022. "Landscape of Climate Finance for Agriculture, Forestry, other Land Use and Fisheries: Preliminary Findings."

United Nations Environment Programme (2023). Adaptation Finance Gap Update 2023. In Adaptation Gap Report 2023: Underfinanced. Underprepared. Inadequate investment and planning on climate adaptation leaves world exposed. Nairobi.

5 Country specific example of climate technologies and agrifood systems

This section will cover a range of country and regional examples to illustrate how climate technologies interventions in agrifood systems have been effective, what was achieved throughout the interventions and how was it supported and enabled. A range of applications will be included to cater for regional differences (Africa, Asia, Latin America etc), variations in agriculture contexts (crops, livestock, forestry, fisheries and aquaculture) and at different stages of the value chains to illustrate the diversity in agrifood systems' stages that exist (from production to consumption). In addition, each case study will aim to draw out specific additional dimensions of climate technology interventions, illustrating examples of gender and smallholder inclusion, financial innovation, social and environmental dimensions. To the degree possible, the country examples will also try to shed light on some of the bottlenecks for deployment of the climate technologies.

The country examples will present:

i. a range of regional balance to bring in examples from the regions of the world to represent the various agrifood systems contexts that can be found globally (Africa, Asia, Latin America) focusing on agrifood systems in developing countries.

ii. differences in stages of the agrifood value chain (production, processing, consumption) to the degree possible

iii. a selection of cases from different agrifood system sub-sectors e.g. crops, livestock, fisheries, aquaculture, forestry.

iv. Diversity in focus elements emerging from the climate technology intervention, e.g. small holders, gender, inclusion, traditional versus advanced technologies, nutrition, livelihood, etc.

Depending on the level of data and information available and the amount of robustly referenced material that can be retrieved on the climate technology cases, between 6-8 country examples will be covered in this section.

The proposed country examples from the field include:

1. Crops and agroforestry in the Sahel with a focus on Senegal
2. Greenhouse technologies with a focus on interventions in Latin America
3. Climate technology in rice processing in Thailand
4. Dairy value chain and climate technology interventions in Kenya
5. Cold storage climate technology for fish storage in Papua New Guinea
6. Delivering collateral-free microfinance to small forest businesses in Vietnam
7. Climate technology, gender and indigenous people (under review)
8. Finance innovation for climate technology interventions in agrifood systems (under review)

The country examples will be structured around:

- Country context, including agrifood system and climate change context
- Overview of the climate technology intervention
- How the intervention was structured, beneficiaries, etc..

In addition, the section will present an overview of climate technology interventions in agrifood systems as reported in the key data sources shared by TEC. This information will be presented in tabular format in the annex to the report and duly referenced by source. A summary overview will be presented in the section.

Sources/resources:
Cases shared and reported by FAO Technical Divisions
Sources/contacts shared by TEC and online sources:
UNFCCC Policies and Technologies for Mitigation: TEC Database https://unfccc.int/topics/climate-technology/resources/policies-and-technologies-for-mitigation?f%5B0%5D=%3A10630&f%5B1%5D=sector_app_tech%3A10630

Ellen Mac|Arthur Foundations: Examples of Circular Economy in the Food Industry: EMF Food Cases https://www.ellenmacarthurfoundation.org/topics/food/examples

World Bank: Climate Smart Agriculture: World Bank https://www.worldbank.org/en/topic/climate-smart-agriculture

CGIAR Case Studies :CGIAR https://pim.cgiar.org/impact/case-studies/

Farming First Case Studies: Farming First https://farmingfirst.org/content-type/case-study/

WWF Triple Challenge Report:
WWF https://www.wwf.org.uk/sites/default/files/publications/Oct20/WWF%20TRIPLE%20CHALLENGE%20REPORT.pdf

Climate Base: Food and Agriculture: Climate base https://climatebase.org/

FAO Climate Smart Agriculture Case Studies: FAO https://www.fao.org/3/CA2386EN/ca2386en.pdf

6 Policy, gaps/opportunities

This section will focus on two major aspects of policies in the context of climate technologies for agrifood systems based on the analysis of the previous sections.

The first is the implications for the development of NDCs and NAPs covering:

- How well are those processes working to support climate technology adoption in the agrifood sector? What are the barriers and challenges?
- What are possible ways to improve upon them?
- Innovation and climate technologies for agrifood systems

The second issue is the need for coordination across different policy domains of climate change, food systems transformation and agriculture. At present these are not well coordinated in most countries, greatly inhibiting their effectiveness. This section will discuss where the major problems lie, and approaches/recommendations to overcoming them.

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7 Conclusions

This section will draw on the content of all previous sections, especially sections 2 to 4, and provide conclusions on the climate technology and agrifood systems interlinkages and way forward.

Annex II

Tentative timeline and actions

In the process of developing the knowledge product, the TEC, the FAO and partners may utilize relevant venues and means to engage with stakeholders and partners and inform the ongoing work. A tentative timeline of suggested actions is provided below, for the consideration by the TEC and subject to the availability of resources.

Timeline	Expected deliverables	Proposed means/actions
Dec 2023- Jan 2024	Defining the scope of the knowledge product and development of a draft outline and case study selection criteria. (FAO)	• Bilateral exchanges with relevant partners and experts
Feb 2024 – Mar 2024	Gathering, reviewing and analyzing information, relevant literature and secondary data, where needed, and commence drafting of sections.	• Soliciting feedback and inputs from stakeholders, partners and experts, including through expert groups and organized sessions.
Feb 2024 – Mar 2024	Identifying and preparing a selection of case studies to highlight elements of the report/lessons learnt.	• Engagement with relevant experts and partners
April 2024 – TEC28	Development of a full complete annotated outline for consideration at TEC 28.	• Seeking expert feedback and review of the document including through experts at FAO and TEC
TEC 28	Agreement on the annotated outline	• TEC to discuss and agree to the annotated outline, and provide guidance to the activity group and FAO to develop the first draft of the knowledge product
May 2024	Development of a first draft of the knowledge product for review.	• Seeking expert feedback and review of the draft including through communities of practice and expert working groups convened by the FAO and TEC activity group
June 2024 – September 2024	Finalize the knowledge product and produce key messages and recommendations.	• As per guidance provided at TEC28, engagement with relevant partners, and inter-sessional work of the activity group, with a view to finalize and release the knowledge product in 2024
September 2024	Finalize document	• TEC 29 to finalize document, key messages and recommendations
October 2024	Finalize publication procedure	• Finalization of document for publication
November 2024	Launch publication	• High-level event to be organized at COP