

Off-grid and decentralized energy solutions for smart energy and water use in the agri-food chain

Technical expert meetings on mitigation
20-21 June 2019
World Conference Centre
Bonn, Germany

Summary report



United Nations
Framework Convention on
Climate Change



Food and Agriculture
Organization of the
United Nations

giz Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH



IRENA
International Renewable Energy Agency



Technical Expert Meetings on Mitigation (TEMs-M 2019) Summary Report

On June 20th-21st, during the UN Climate Change Conference in Bonn (SB50), experts gathered to discuss "off-grid and decentralized energy solutions for smart energy and water use in the global agri-food chain" as a part of the 2019 Technical Expert Meetings on Mitigation. The meetings mainly focused on promoting the water-energy-food nexus to address the issues related to increasing demand for food from a growing global population, which in addition to climate change, is placing significant pressure on agricultural production and natural resources.

This year's technical expert meetings were led and organized by Food and Agricultural Organization of the United Nations (FAO), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), International Renewable Energy Agency (IRENA), and the Stockholm International Water Institute (SIWI), supported by the UNFCCC secretariat.

The experts shared not only their hands-on experiences but also ideas and suggestions for Parties and non-Party stakeholders to replicate and upscale innovative approaches.

All relevant information on meetings (including programme, speakers, presentations, audio-video recordings and background information) can be found here:

<https://unfccc.int/topics/mitigation/workstreams/technical-expert-meetings>

Summary for session 1 (coordinated by GIZ and SIWI)

What is the session topic?

Decarbonizing the primary food production phase of the agri-food chain

What are the key issues/challenges discussed during the session?

- Primary food production, both in the areas of irrigation and fertilizer production and usage, is carbon intensive because of its heavy reliance on fossil fuel energy.
- Primary food production wastes a great deal of water, further exacerbating climate change.
- Although smart water and smart energy solutions, such as solar and water-powered irrigation pumps, exist at various local levels, there are capacity and financing bottlenecks that prevent uptake, upscaling, and replication.

What are the solutions/opportunities identified?

- There is a rapid acceleration of developments around water and energy use in irrigation, and this presents an opportunity to decarbonize 200 to 300 million smallholder farms who are about to leap into mechanized irrigation systems.
- Precision farming, aided by tools that provide accurate rainfall data, number of solar hours, and soil moisture levels, can contribute to more efficient and effective farming practices that curb emissions.
- Mitigation solutions in agriculture that empower subsistence/smallholder farmers and women can lead to major social and economic co-benefits ranging from women's empowerment to increase in income to more abundant and nutritious foods.
- Information and communication to the end user – the farmers and other stakeholders – is key. Stakeholders need to understand price differences between conventional energy and renewable energy and trade-offs (water for agriculture versus water for hygiene and sanitation).

- Governments providing R & D funding to universities/ research organisations for developing low-carbon agri-food system could be one way forward.

What are the take-away messages/recommendations for the Parties and non-Party stakeholders?

- The quality of renewable energy technologies needs to be assured through testing and international standards, since any failures will result in lack of confidence by potential users.
- What is needed for smart agriculture (smart water and smart energy use in agriculture) is technological advancement, partnerships, investment and capacity building.
- One effective approach to financing smart water and smart energy tools is a hybrid of public and private financing, and for this reason, an environment that enables public private partnerships is crucial.
- Raise awareness of farmers, public sector players as well as financing institutions. They need "to see to believe" to see first-hand the business case for smart agriculture.
- Reduce / abandon fossil fuel subsidies.



Summary for session 2 (coordinated by GIZ and FAO)

What is the session topic?

Decarbonizing the post-harvest phase of the agri-food chain

What are the key issues/challenges discussed during the session?

- The food losses and GHG emissions occurring at storage, transport and processing levels.
- Energy efficiency measures have important role to play.

What are the solutions/opportunities identified?

- Several technological solutions (such as solar cooling solutions, natural refrigerant applications, assessments and improvements of energy efficiency) are currently available but need innovative approaches for their business model assessments.
- High impact case studies on post-harvest technologies that provide good examples of avoiding food waste, improving water use efficiency, having low-carbon footprints, and scaling-up, should be widely disseminated.
- Quick wins are possible with energy efficiency interventions and some renewable energy interventions (energy efficiency saving potential up to 20% in agricultural value chains according to IRENA), if a conducive policy framework exists and private sector engages.
- Anchor and adapt solutions to local context (manufacturing, servicing, training).

What are the take-away messages/recommendations for the Parties and non-Party stakeholders?

- Need to move beyond access to energy to productive use of energy in rural areas to improve farmers' business case, thus making energy more affordable and improving the business case of energy suppliers.

- The implementation of decentralized renewable energy solutions for cooling, storage and local transport of food can minimize losses and their associated costs. Such solutions can maximize profits for farmers while also contributing to food security.
- Training of technicians, auditors and decision-takers, and trainers is very important. It should be anchored in local training institutions.
- Favorable policies and regulations are necessary for improving energy efficiency and promoting the use of renewable energy and natural refrigerants (e.g., making regular energy audits obligatory; reducing import duties).
- Access to finance and appropriate payment schemes (e.g., pay-as-you-go) is required for end-users on the farm as well as factory level.
- Viable business models and financing opportunities for technology providers exist. (e.g., decentralized renewable energy (RE) systems can be very competitive compared to diesel-powered systems, depending on the system utilization, storage technology and battery management).
- Cross-sectoral cooperation of different stakeholders is necessary (private sector, financing sector, sectoral ministries, NGOs and other development partners).



Summary for session 3 (Coordinated by FAO)

What is the session topic?

Circular economy solutions/innovations in water and energy management for agri-food chains

What are the key issues/challenges discussed during the session?

- Agri-food systems are largely reliant upon conventional energy sources, contributing to anthropogenic climate change.
- Agriculture is the number one user of water but also can be a solution to the water crisis through the reclamation and reuse of domestic and industrial wastewater and nutrient cycling for agricultural uses.

What are the solutions/opportunities identified?

- Biogas capture from both small and large wastewater treatment systems could provide energy for heat, electricity or transport fuels and thereby reduce fossil fuel demand and stimulate the local economy.
- The circular economy should help to accelerate the delivery and diffusion of proven technologies in recovering phosphates and nitrates from wastewater treatment and reusing them for crop and pasture production, by creating support in the regulatory space.
- Governance can play an important role in public, non-market systems by placing a value on water resources and facilitating infrastructure required for a circular economy (e.g., for transporting treated wastewater to farms).

What are the take-away messages/recommendations for the Parties and non-Party stakeholders?

- Education and awareness can help identify where circular economies can be created to increase water use and improve energy efficiency. Such actions can result in cost savings and provide fertile ground for businesses, due to the economic benefits.
- Government policies, grants and other incentives can help to scale-up the circular economy for the water and energy supply sectors in the agri-food chain, but coherent policies between ministries and national and local authorities are also required.
- Circular economies can help promote sustainability throughout the agri-food sector and also increase the value-chain through energy, transport, and water inputs.
- Investment opportunities exist in developing circular economy solutions (including through crowd-financing schemes) that can result in more efficient energy and water use. These outcomes can also be scaled-up in the future.
- Water reclamation from food processing and wastewater treatment plants is challenging and not always cost-effective unless environmental externalities and development co-benefits are also taken into account.
- Circular economy interventions fully comply with the "2030-Agenda for Sustainable Development" (notably SDGs 1, 2, 6, 12,13 and 15) that aim to transform the world to become a better place.
- The range of co-benefits from implementing a circular economy can help meet the objectives of Nationally Determined Contributions for some economies.



Summary for session 4 (Coordinated by FAO)

What is the session topic?

Nature based solutions to integrate energy and water aspects into the agri-food chain

What are the key issues/challenges discussed during the session?

- The regeneration process requires ample space and time, which intrinsically means that many stakeholders are involved. Therefore, a joint approach early in the planning phase is necessary for Nature-Based-Solutions (NBS).
- Other challenges frequently include the complexity of the interrelated issues and the time required for benefits related to NBS and silo policies to materialize.

What are the solutions/opportunities identified?

- NBS preserves the integrity of ecosystems in terms of soil moisture, forest/soil carbon sequestration, and conserves groundwater with minimal biodiversity impacts. It has many co-benefits including the preservation of genetic diversity for resilient food systems.
- NBS is a low-energy intensive solution, avoiding energy inputs by facilitating natural processes that capture surface water, increase soil moisture and filter pollutants that otherwise may end up in receiving water bodies. At the same time, NBS aims to stabilize water flows for sustainable crop yields.

What are the take-away messages/recommendations for the Parties and non-Party stakeholder?

- NBS supports agricultural transformation of food production systems and can save energy inputs by utilizing renewable, natural resources in an integrated land and water management framework, while maintaining landscape diversity and ecological integrity.
- Policies relating to the management of eco-system services must be holistic, realising that ecosystems involve a range of different stakeholders, often with conflicting interests.
- Assisted natural regeneration is sometimes required to restore ecosystem services in degraded landscapes, which can then contribute to mitigation actions in addition to sustainable development co-benefits for local communities.
- To preserve NBS over the long term, it is necessary to produce open access policies and shared ownership, with all stakeholders jointly making common property resource regulations. Policies are most effective when they incorporate traditional knowledge, because it considers regional issues and lessons learned over many generations corresponding to primary agricultural production (including fishing).
- Urban food production systems are rapidly evolving with good potential for supplying a significant share of a city's total food supply. Innovative solutions require the integration of small-scale farming practices into the urban context, along with innovative food production technologies that draw on NBS for sustainable water use.
- Future policies and land use regulations need to accommodate urban food production practices.
- Implementation of NBS related to water-energy-food requires government action and funding. There are also feasible opportunities for private sector investment where the provision of eco-system services can provide a return on investment.
- Sufficient time must be available to assess benefits of NBS, as these often take time to materialise. This also means that subsidies/incentives are needed for implementers at early stages of implementation.



Summary for session 5 (coordinated by IRENA)

What is the session topic?

Making Water-Energy-Food integrated policies work for food security and the climate

What are the key issues/challenges discussed during the session?

- The livelihood of most rural people relies on agriculture and irrigation for subsistence through household farming and for income and jobs.
- Many rural communities struggle with a lack of access to and affordability of resources and are often limited to producing low-quality goods with little diversity and with low productivity.

What are the solutions/opportunities identified?

- Granting rural areas access to affordable, secure, and environmentally sustainable energy along the different stages of the agri-food chain can support the development of communities through savings on fuel spending, job creation, poverty reduction, improved health, enhanced access to water and food, better livelihoods, and gender equality.
- Strong policies and measures that support the deployment and scale-up of decentralized sustainable energy systems along the agri-food value chains have demonstrated success, but need wider uptake across other economies.
- Integrated policies for water-energy-food can help realize the targets for Nationally Determined Contributions (NDCs) and Sustainable Development Goals (SDGs).
- Co-benefits from these policy solutions include improved livelihoods, increased social welfare, and reduced spending on centralized infrastructure, as well as lower fossil fuel subsidies.

What are the take-away messages/recommendations for the Parties and non-Party stakeholders?

- Government subsidies for renewable energy and smart water use schemes have been effective in scaling up new technologies and practices.
- Agriculture is complex and context specific. Therefore, farmers and communities should be consulted and involved in research that subsequently feeds into new policies. New support policies and measures can rapidly introduce new technologies, such as solar irrigation systems, which can significantly transform the traditional agricultural system. This, in turn, makes capacity building among the local farmers, necessary.
- Water efficient farming practices, such as drip irrigation, often need to be coupled with energy-smart technologies and data gathering to ensure that potential issues, such as over-irrigation, can be avoided.
- Statistical data is often lacking for policy makers – for example, knowing what impacts the introduction of irrigation systems will have on water abstraction rates and downstream water users.
- Introducing integrated policies for water/energy/food can benefit from collaboration between relevant ministries, as well as from vertical collaboration between national, state and local governments.
- Partnerships between research institutes, the private sector and policy-makers are essential for commercialization and up-scaling of innovative technologies. These partnerships can be facilitated through knowledge-sharing platforms that help to provide relevant information to decision makers, finance agencies, and other stakeholders.
- The accountability of governments to implement innovative solutions and help meet NDC targets, requires increased transparency and consultation with experts during the decision-making process.



Annex : Programme Agenda

| Day 1 (20 June 2019) | |
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| <p>Time: 11:00-11:30 Room: GENF, the World Conference Center Bonn</p> | <p>Opening remarks</p> <p>Moderator:</p> <ul style="list-style-type: none"> • Ms. Marion Canute, Communication Specialist <p>Speakers:</p> <ul style="list-style-type: none"> • Mr. Emmanuel Dumisani Dlamini, Chair of the Subsidiary Body for Implementation (SBI) • Mr. Martin Frick, Senior Director, UNFCCC • Mr. Bernd-Markus Liss, Head of Section-Climate Change and Climate Policy, Gesellschaft für Internationale Zusammenarbeit (GIZ) • Mr. Torgny Holmgren, Executive Director, Stockholm International Water Institute(SIWI) |
| <p>Time: 11:30-13:00 Room: GENF, the World Conference Center Bonn</p> | <p>Session 1: Decarbonizing the primary production phase of the agri-food chain</p> <p>This session, with the help of high-impact case studies/examples and input from a diverse range of experts, analysed the opportunities presented by, but also factors limiting, technological solutions and innovative approaches. Participants discussed and shared experiences on the necessary policy environment, best practices in fostering partnerships and need of capacity building and accessing financial resources for the replication and upscaling of solutions.</p> <p>Moderator:</p> <ul style="list-style-type: none"> • Ms. Marion Canute, Communication Specialist <p>Speakers:</p> <ul style="list-style-type: none"> • Ms. Jennie Barron, Professor, Agricultural Water Management at Swedish University of Agricultural Sciences (<i>In-person participation</i>) • Ms. Melina Balderrama Duran, National Project Coordinator, Bolivia WATCH at HELVETAS(<i>In-person participation</i>) • Mr. Pratap Thapa, Co-founder and Business Development Manager, aQysta (<i>In-person participation</i>) • Mr. Daniel Paska, Technology for Good Program Director, Ericsson (<i>Remote-online participation</i>) • Mr. Henrik Johansson, Founder and CEO, Spowdi AB (<i>Remote-online participation</i>) • Mr. Gaurav Kumar, Co-founder and Director, Claroenergy Pvt Ltd (<i>In-person participation</i>) • Ms. Romina Cavatassi, Senior Economist, International Fund for Agricultural Development (<i>In-person Participation</i>) |

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| <p>Time: 14:00–15:30 Room: GENF, the World Conference Center Bonn</p> | <p>Session 2: Decarbonizing the post harvesting phase of the agri-food chain</p> <p>During the session, with the help of high impact case studies/examples, currently available technological solutions and innovative approaches for business model assessments, climate-friendly agricultural processing solutions that bear great adaptation and scaling-up potential in the short term were discussed. Participants contributed their knowledge about specific barriers for a conducive enabling environment and how they can be overcome. They complemented the speakers proposed fast gains until 2020.</p> <p>Moderator:</p> <ul style="list-style-type: none"> • Ms. Marion Canute, Communication Specialist <p>Speakers:</p> <ul style="list-style-type: none"> • Mr. Julian Krüger, University of Hohenheim, Institute of Agricultural Engineering, Germany (<i>In-person participation</i>) • Mr. Antoine Azar, HEAT Consultant (<i>In-person participation</i>) • Mr. Macben Makenzi, Certified Energy Manager and National GIZ Powering Agriculture Staff (<i>In-person participation</i>) • Ms. Jennifer Sharp, Ethical Tea Partnership (<i>In-person participation</i>) • Ms. Georgia Badelt, Founder and Director, GeoCode International (<i>In-person participation</i>) • Mr. Olivier Dubois, FAO (<i>In-person participation</i>) • Ms. Stefania Bracco, INVESTA team of FAO (<i>Remote-online participation</i>) |
| <p>Time: 15:30–17:00 Room: GENF, the World Conference Center Bonn</p> | <p>Session 3: Circular economy solutions/innovations in water and energy management for the agri-food chain</p> <p>This session discussed ways of creating circular economies in the agri-food chain to reduce food waste, use energy, and water more sustainably. The concept of using agricultural waste products and biogas for energy production and process inputs were explored, particularly where improvements in energy and water use can be made. This also briefly touched up on required business models, conducive policy environment and SDG co-benefits.</p> <p>Moderator:</p> <ul style="list-style-type: none"> • Mr. Ben Sonneveld, Deputy Director, Amsterdam Centre for World Food Studies/ Athena Institute VU University Amsterdam <p>Speakers:</p> <ul style="list-style-type: none"> • Mr. Belal Shaqareen, Ministry of Agriculture, Environment and Water, Jordan (<i>Remote-online participation</i>) • Mr. Miquel Salgot, Universidad de Barcelona (<i>In-person participation</i>) • Mr. Gabriel Okello, Green Heat (<i>Remote-online participation</i>) • Mr. Kalanithy Vairavamoorthy, IWA (<i>Remote-online participation</i>) • Ms. Sasha Koo-Oshima, FAO (<i>In-person participation</i>) • Mr. Oriol Bellot, Agriculture Projects Director, Suez (<i>In-person participation</i>) |

| Day 2 (21 June 2019) | |
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| Time: 11:00-12:30 Room: GENF, the World Conference Center Bonn | <p>Session 4: Nature based solutions to integrate energy and water aspects into the agri-food chain</p> <p>This session focused on various Nature based solutions (NBS) that integrate energy and water aspects into the agri-food chain development. It provided a platform to discuss the requirements for successful implementation of NBS to integrate energy and water aspects into agri-food chain, institutional challenges, and the potential of scale-up opportunities. Nature-Based Solutions (NBS) for food security constitute a new paradigm that uses or mimics ecosystem services to enhance land and water quality for agricultural production, while preserving the integrity of ecosystems. The Water-Energy-Food (WEF) approach in the context of NBS can significantly improve energy access, water quality and availability for sustainable agriculture and food production in line with SDGs 1, 2, 6, 13 and 15. WEF/ NBS can also help attain adaptation and mitigation co-benefit objectives of Nationally Determined Contributions (NDC).</p> <p>Moderator:</p> <ul style="list-style-type: none"> • Ms. Sasha Koo-Oshima, FAO <p>Speakers:</p> <ul style="list-style-type: none"> • Mr. Ben Sonneveld, Deputy Director, Amsterdam Centre for World Food Studies/ Athena Institute VU University Amsterdam (<i>In-person participation</i>) • Mr. Peter Minang, World Agroforestry Center, ICRAF (<i>In-person participation</i>) • Mr. Francisco Pedrero Salcedo, Mediterranean Youth for Water Network (<i>Remote-online participation</i>) • Ina Saumel, Humboldt University (<i>In-person participation</i>) • Ms. Andrea Erickson, The Nature Conservancy (<i>Remote-online Participation</i>) • Ms. Beatriz Ebil, Universidad Nacional de Misiones Argentina (<i>Remote-online participation</i>) |
| Time: 12:30-14:00 Room: GENF, the World Conference Center Bonn | <p>Session 5: Making Water-Energy- Food integrated policies work for food security and the climate</p> <p>This session discussed policy solutions for producing affordable, reliable, and environmentally sustainable energy for the agri-food and irrigation value chains and the benefits that these solutions can bring, particularly improved livelihoods, increased social welfare, and reduced spending on fossil fuel subsidies and centralized infrastructure. The session also highlighted barriers for conducive policy frameworks and how they can be overcome. The session also discussed how these policies and enabling frameworks can harvest socio-economic benefits and thus lead to the realization of Nationally Determined Contributions (NDCs) and Sustainable Development Goals (SDGs).</p> <p>Moderator:</p> <ul style="list-style-type: none"> • Ms. Marion Canute, Communication Specialist <p>Speakers:</p> <ul style="list-style-type: none"> • Mr. Prince Essel, Co-Founder and CEO, Maisevill Group (<i>In-person participation</i>) • Ms. Margaret Koli, Education Programme Assistant, UN-University (<i>In-person participation</i>) • Ms. Sasmita Patnaik, Programme Lead, Council on Energy, Environment and Water (<i>In-person participation</i>) • Ms. Sarah Alexander, Senior Advisor, SELCO Foundation (<i>In-person participation</i>) • Mr. Chris Henderson, Senior Policy and Practice Advisor in Agriculture, Practical Action (<i>In-person participation</i>) • Ms. Petra Schmitter, Research Group Leader, International Water Management Institute (<i>In-person participation</i>) |

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| <p>Time: 16:00–17:30 Room: GENF, the World Conference Center Bonn</p> | <p>Session 6: Replicating and upscaling innovative solutions for securing clean energy and water access for the agri–food chain</p> <p>This session reported back from the previous sessions covering key discussion points and messages. Based on these reports, it sought to explore ways forward and necessary actions to be taken by Parties, non-Party stakeholders and organizations to replicate and upscale identified policy options, technological innovations and best practices for securing clean energy and water access for the agri–food chain. Parties and non-Party stakeholders were provided with a space to share experiences of actions already taken, support already provided/received and to highlight their planned actions/support in relation to the replication and upscaling of identified policy options, technological innovations and best practices.</p> <p>Moderator: Ms. Marion Canute, Communication Specialist</p> <p>Speakers:</p> <ul style="list-style-type: none"> • Mr. Torgny Holmgren, SIWI • Ms. Maria Weitz, GIZ • Mr. Olivier Dubois, FAO • Ms. Claire Kiss, IRENA • Ms. Dinara Gershinkova, the Chair of Technology Executive Committee • Mr. Federico Villatico Campbell, Regional Manager, Climate Change Technology Centre and Network |
| <p>Time: 17:30–18:00 Room: GENF, the World Conference Center Bonn</p> | <p>Closing remarks</p> <p>Moderator:</p> <ul style="list-style-type: none"> • Ms. Marion Canute, Communication Specialist <p>Speakers :</p> <ul style="list-style-type: none"> • Mr. Paul Watkinson, the Chair of Subsidiary Body for Scientific and Technological Advice (SBSTA) (tbc) • Mr. Gonzalo Munoz, The High-Level Climate Action Champion • Mr. Olivier Dubois, FAO • Dr. Dolf Gielen, Director, IRENA Innovation and Technology Centre |



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