APEC Workshop on Promoting Sustainable Energy for Small Farmers towards Climate-friendly Agri Value Chains

Ha Noi, Viet Nam | 23 - 24 April 2024

APEC Energy Working Group

September 2024

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Workshop Summary Report

I. Introduction

On 23 & 24 April 2024, the "APEC Workshop on Promoting Sustainable Energy for Small Farmers towards Climate-friendly Agri Value Chains" was held in Ha Noi, Viet Nam. The project was led by Viet Nam and co-sponsored by Hong Kong, China; Indonesia; Mexico; Papua New Guinea; and the Philippines. Speakers and participants came from the private sector, business associations, international organizations, research institutions, and APEC economies' relevant ministries and government agencies.

The objectives of the "APEC Workshop on Promoting Sustainable Energy for Small Farmers towards Climate-friendly Agri Value Chains" are to provide capacity building for member economies, especially developing ones how to figure out practical approaches and possible cooperation areas to enhance the adoption of sustainable energy for agri-food values chains through sharing information, experiences, best practices and case studies.

II. Background

According to a joint report by the Food and Agriculture Organization of the United Nations (FAO) and International Renewable Energy Agency (IREA), "energy and food systems are deeply entwined. About 30% of the world's energy is consumed within agri-food systems. Energy is also responsible for a third of agri-food systems' emissions of greenhouse gases" and that energy consumption

in agri-food systems increased by more than 20% between 2000 and 2018.[1] Therefore, it is essential that both systems should be transformed for increasing demand for both food and energy while still committed to environmental sustainability and inclusivity in the long term.

In that context, it is worth noting that about two-thirds of the developing world's 3 billion rural people live in about 475 million small farm households, working on land plots smaller than 2 hectares. Many are poor and food insecure and have limited access to markets and services.[2] They might have low awareness of sustainable energy toward climate friendly agri-food value chains, limited capability in implementation without concrete and practical support.

Such efforts and commitments required strong concerted action by decision makers in governments, private sectors, international organizations, financing, academia and non-governmental organizations, which remains a great challenge in identifying a practical approach and implementation. This project will focus on identifying the challenges, exploring approaches to implementation, and potential cooperation areas through sharing information, experiences, best practices and case studies.

This project is in line with the APEC 2022 Leaders' Declaration that states "our commitment to promote strong, balanced, secure, sustainable and inclusive growth. We recognise that more intensive efforts are needed to address today's challenges, including climate change, extreme weather and natural disasters, food security, and sustainable energy transitions that reduce greenhouse gas emissions, while ensuring energy resilience, access and security in the region" and that "We recall our commitment to rationalise and phase out inefficient fossil

[1] https://www.fao.org/3/cb7433en/cb7433en.pdf

[2] George Rapsomanikis, 2015. The economic lives of smallholder farmers. Food and Agriculture Organization of the United Nations (FAO)

fuel subsidies that encourage wasteful consumption, while recognising the importance of providing those in need with essential energy services".

It is also in line with the Leaders' commitments to "expedite and intensify our work to promote agricultural development, including in rural areas, and promote long-term food security by ensuring our agricultural and food systems are more resilient, productive, innovative and sustainable".

This project is also in line with the EWG's strategic plan 2019 – 2023 that states "Strengthen coordination and cooperation through sharing best practices, accelerating innovation and promoting the deployment of advanced technologies, including renewable energy, energy efficiency, cleaner and more efficient fossil fuels, hydrogen, and nuclear energy for interested economies, adhering to nuclear safety, security, safeguards, and peaceful use". With the focus on sustainable/renewable energy in agri-food chains, it would help to promote renewable energy for long term sustainability in the region. It is also in line with the EGRNET' mission to facilitate an increase in the use of new and renewable energy technologies in the APEC region.

It is reported that over 2.5 billion people worldwide rely on agriculture for their livelihoods. However, present patterns of energy use in agri-food systems point to regional disparities, lack of access to modern energy (especially in the developing world) and continuing dependence on fossil fuels.[3] Bear that in mind, this project will focus on provide capacity building to developing economies in particular to promote adoption of sustainable/renewable energy in agri-food chains, which would significantly benefit agricultural industry in general, small farmers, women, in particular

[3] https://www.fao.org/3/cb7433en/cb7433en.pdf

III. Key Issues

1. Overview of energy/ sustainable energy, and agri-food systems

Mr Tran Tuan Duong, Researcher, Centre of Renewable Energy, Viet Nam: Renewable energy is increasingly playing an important role especially when major challenges caused by climate change such as prolonged water shortages, droughts, saltwater intrusion, seasonal climate changes, etc., occur on a global scale more frequently. In the context that agriculture uses a large amount of energy, from fossil fuels such as gasoline, diesel, liquefied petroleum gas (LPG) to electricity for activities such as operating machinery, irrigation systems, lighting and preserving agricultural products, etc., agriculture has become an industry with great potential for renewable energy application, contributing to the goal of reducing greenhouse gas emissions.

Transitioning to sustainable and efficient alternative energy sources has become an urgent need, not only to protect the environment but also to ensure health and sustainable development for future generations. The adoption of renewable energy in agriculture brings many long-term benefits, from reducing energy costs, protecting the environment, to improving sustainability for the agricultural industry. For example, solar power can provide electricity for farms, irrigation systems, heating and drying of agricultural products; wind energy is used to run machinery, water pumps and other electrical equipment on the farm. Biomass from sources such as agricultural residues, animal waste and energy crops can be converted into fuels (such as biogas or biomass pellets) for heating, cooking or electricity generation, which helps to utilize and recycle agricultural waste, contributing to reducing greenhouse emissions. Small hydropower is developed on small rivers or streams without adverse impact on the surrounding environment, which can provide power in a stable manner to rural and farm communities in off-grid areas or as a backup power source without emitting greenhouse gases.

However, the adoption of renewable energy also encounter technical challenges. The instability of energy sources and the need to install complex technology might depend largely on natural conditions. For example, solar panels and wind turbines are dependent on weather and geographical conditions, which may not be suitable for some rural areas with unstable climatic conditions. In addition, the performance of solar panels using current technology can be significantly reduced in cloudy, dusty weather conditions, affecting the continuous supply of energy for agricultural activities. In addition, initial cost is still high, which will hinder the adoption of technological innovation and investment into renewable energy. The lack of knowledge and skills about renewable energy also remains a challenge since most farmers do not clearly understand the benefits and how to effectively deploy renewable energy technologies into practice. In that way, it is necessary to establish a stable, long-term policy framework and supportive incentives along with simplifying the implementation process to facilitate the adoption of renewable energy in agriculture.

2. Identifying opportunities and challenges to promote sustainable energy for small farmers towards climate-friendly agri-food value chains

Dr Tzong-Ru Lee, Professor, Chung Hsing University (NCHU), Chinese Taipei: Although currently, fossil fuels are still the most widely used energy source in the world, renewable energy is developing rapidly. With the advancement of technology, the utilization rate of renewable energy will become higher and higher, and it will play an increasingly important role in the future energy structure.

Agricultural production requires a lot of energy, including electricity, fuel, and fertilizers. Traditionally, agricultural production mainly uses fossil fuels, but the use of fossil fuels will cause environmental pollution and resource depletion. Therefore, the development and utilization of renewable energy has become an

inevitable trend in agricultural development recently. In practice, solar, wind, and biomass energy are renewable energy that are most suitable for small farmers. Solar energy is a clean and renewable source that can be used for irrigation, lighting, and drying in agricultural production; wind energy can be used for irrigation, drainage, and power generation; biomass energy can be used for heating and power generation in agricultural production, etc.

Chinese Taipei has made big efforts to promote small farmers to adopt renewable energy (solar, wind, biomass, etc.,) in conducting agricultural production. For example, Chinese Taipei is facing with increasing risks of drought and the tea industry alone lost USD4.4 million in 2023 due to drought. In that case, farmers such as "Wang Family Tea" is promoted to use rice husks and solar energy to conserve water and reduce carbon emissions in tea gardens. In this farm, they used solar-insect-catching lamps and carbonized rice husks to reduce pesticide, which is environmentally friendly, renewable energy-based, and contributes to lowering carbon emission, saving water, reducing costs, and hence, enhancing agricultural sustainability, ecology as well as human health.

Mr Edi Wibowo, Director of Bioenergy, Ministry of Energy and Energy Conservation, Republic of Indonesia*:* Indonesia is an archipelagic economy that is vulnerable to the impacts of climate change. Indonesia experiences a sea level rise of 0.8 to 1.2cm per year while 65% of the population lives in coastal areas. Climate change can increase the risk of hydro-meteorological disasters, which currently account for 80% of total disasters in Indonesia (NDC, 2016). Indonesia's potential economic losses could reach 0.66%-3.45% of GDP in 2030.

In that context, Indonesia's policy goal is to achieve domestic energy independence and security, which in turn supports sustainable development. In that sense, they focus on re-establishing Indonesia's energy independence by re-directing energy resources from export to the domestic market, rebalancing the

energy mix towards indigenous energy supplies, reducing dependence on fossil fuels and developing renewable energy resources.

Indonesia has made great efforts to promote renewable energy in agriculture. For example, they develop micro hydro power plan (MHPP) to promote agriculture development in Tepal village, Sumbawa regency, West Nusa Tenggara. This MHPP was built by the Ministry of Energy and Mineral Resources in 2009 (MHPP 1) with a capacity of 25kW, and the Ministry of Cooperatives and SMEs (MHPP 2) with the capacity of 40kW. Both plants are managed by a local multi business cooperative called KSU Puncak Ngengas. MHPP 1 and 2 are operating 24 hours a day and provide electricity for 339 houses; 3 schools; 1 mosque; 1 health centre; 20 stalls; 7 productive workshops.

The electricity produced from the MHPP in Tepal Village is also used for coffee processing. In the past, the local growers sold fresh coffee beans USD1.3/kg. Now they can process the coffee beans themselves, pack the end-products and sell at that price of 900% higher. The price of its premium Arabica coffee is now USD2.5/250gr, ginger coffee USD2.2/250gr, local Arabica coffee USD1.7/250gr, Robusta coffee USD1.25/250gr, and Luwak Coffee USD6.5/200gr. These coffee products that are well packaged for end-users make the distribution system easier and cheaper. The cooperative utilizes local college students who study in other islands to become sellers and distributors of Tepal Coffee.

In Indonesia, it is recognized that integrating renewable energy with sustainable agriculture practices can enhance food security, minimize environmental impacts, and foster rural development through decreasing dependence on the traditional energy grid and fossil fuel as well as providing a long-term cost-saving mechanism in agriculture, which contributes to achieving global sustainability goals (SDGs).

However, Indonesia also find challenges in promoting renewable energy for sustainable agriculture since it requires a relatively large initial investment; complex technologies both in functioning and maintenance; social and cultural acceptability while in practice, the public awareness is still limited; and there still remains lack of skilled technical experts on renewable energy technologies as well as issues related to finance, technique, society, regulatory and competition for natural resources, which make farmers hesitant in making a decision in investing a renewable energy system for their own business.

To encourage the adoption of renewable energy for agriculture for sustainability and inclusivity, Indonesia recognizes the need to develop measures and improve a mechanism to promote it, including developing policy frameworks and regulations to incentivize the adoption of RE technologies; increasing the efficiency of renewable systems to ensure a stable and reliable energy supply; promoting a massive education/ socialization to enlighten citizens, particularly in rural communities, about the benefits of renewable energy sources; promoting international collaboration, knowledge exchange, sharing best practices, and joint research to tackle global sustainability challenges; and so on.

***Mr GAO Yang, Program Officer, China Energy Administration*:** In response to the climate crisis, the world has reached consensus in developing and promoting renewable energy. While agriculture is recognized to consume much of energy, agriculture-complementary solar power appears as an emerging industry that integrates solar power generation, agricultural production, and agricultural facilities. In practice, the production mode of agriculture-complementary solar power mainly includes three combinations: "PV + agriculture"; "PV + livestock and poultry industry"; and "PV + fisheries", in which “PV + agriculture” combines photovoltaic power generation with greenhouse cultivation, field cultivation, mushroom cultivation, tea gardens, etc.,; “PV + livestock and poultry industry” combines power generation with animal husbandry; and “PV + fisheries” combines photovoltaic power generation with fish farming, with solar

panels installed above the water surface for power generation and the underwater areas used for aquaculture.

In recent years, the development of agriculture-complementary solar power projects has been rapid, spreading to various corners of the world with the installed capacity surging from about 5MWp in 2012 to at least 200GW by 2023. For example, since 2010, Germany has promulgated the Renewable Energy Sources Act. France and Italy completed their first batch of agriculture-complementary solar power projects in 2011; France also proposed a domestic subsidy plan in 2017. China has been developing the agriculture-complementary solar power construction model since 2014.

However, the development of agriculture-complementary solar power projects encounters a great number of challenges. The construction of PV power stations needs to consider various factors such as light, temperature, and shade to ensure power generation efficiency. Agricultural production needs to consider the impacts of photovoltaic power stations on crop growth, such as light intensity, temperature distribution, etc. Besides, there remains an uncertainty in project returns, as well as financial risks, which might make investment less attractive than in other projects.

Despite the challenges, there remain potential for agriculture-complementary solar power. With strengthened research capacity, technical factors can be further improved, as well as enhancing innovation, industrial standardization and sustainable development in the long term.

3. Raising awareness, building capacity and developing approaches and tools to promote sustainable energy for small farmers towards climate-friendly agri-food value chains

Ms Pham Thi To Oanh, Director, Viet Nam Cooperatives Alliance: Viet Nam's small farmers encounter a number of difficulties in operation in the efforts to adopt sustainable energy toward climate-friendly agri-food chains in their

practice. Firstly, the legal corridor to ensure sustainable linkages is weak and lacks strong mechanisms to promote and implement the production in a sustainable way. Small farmers also find it difficult to access preferential loans to expand production and sales. Human resource is an issue when most of small farmers do not receive adequate training, hence, find it challenging to apply scientific and technical advances to improve productivity and product quality to be more competitive in the market. The small and fragmented production land scale and scope also affect the possibility to attract businesses to associate with farmer households and production units to form an area large enough for investment and scientific application (especially high-tech agriculture in order to maximize the production efficiency of agricultural products).

This limited capacity might result from the fact that farmers' awareness of climate-friendly agri-food chains is still low, leading to ineffective management, policy, consultation and support.

Some solutions are recommended to promote sustainable energy towards climate-friendly agri-food chains, including but not limited to: raising the awareness of potential benefits of sustaiable energy toward climate - friendly agri-food chains; promoting the accumulation and concentration of agricultural land to promote concentrated and large-scale production areas; promoting the production of large, uniform and quality products through ensuring input and output products as well as improving farmers' capacity to meet market demand; and so on.

Mr Bastian Celis, Comisión Nacional de Riego (CNR), Chile: In the last decades, Chile has made great efforts in adopting renewable energy through promoting incentives and policies to install and distribute renewable, especially solar to households and agricultural sectors. Currently, the installed capacity in distributed generation projects for self-consumption amounts to 233MW, with the agricultural sector representing 39% of the total.

Chile Irrigation Commission (CNR) is in charge of Chile irrigation and drainage policy in accordance with the strategic and ministerial guidelines. It administers the Law No. 18.450 on the promotion of private investment in irrigation and drainage for small agriculture, peasant family agriculture, women and indigenous people. They also carry out studies, programs and projects that encourage the management and efficient use of water resources which strengthen the management of Water User Organizations.

In Chile, the Law No. 18.450 plays an important role in promoting private investment in irrigation and drainage. It aims to promote co-financing for expenses associated with the study, construction, and restoration of irrigation or drainage infrastructure as well as promote investments in mechanical, irrigation equipment and related components, covering all irrigation infrastructure or other applicable uses.

The Ministry of Energy and CRN have strengthened collaboration through promoting the development of irrigation projects including supply of renewable energy, use of energy efficiency and distributed generation through the resources under the Law No. 18.450

4. The importance of collecting better data to guide sustainable energy investment in food systems and strengthening innovation

Ms May Kuo, Sun Rise E&T Corporation, Chinese Taipei: As the world's 2nd largest manufacturer of HDPE offshore fish cage and the world's 3rd largest manufacturer of HDPE floating solar system, the speaker focuses on the integration of aquaculture and solar energy. HDPE is 100% recyclable, anti-acid and alkali, and strongly durable when it can expose to sun from 50 to 100 years, which is suitable and efficient to be produced in floating solar system.

So as to have sufficient data for the production and adoption, the company makes efforts to collect data in fishery and electricity. For example, they collect data on various species (milkfish, tilapia, prawn, perch, etc.,) in the same period in

different sites and find out that the adoption of floating solar system can contribute to the growth of fish thanks to 40% of the shading, stabilizing water temperature (both in summer and winter), stabilizing salinity. Although there might be less photosynthesis (lower oxygen solubility), it does not impact the growth of species in general. They also collect and analyze other factors such as clam growth, algal, bacteria, benthic biology and monitor the growth status, water quality (dissolved oxygen, temperature, pH value and ammonia nitrogen concentration) based on smart communication recorder (real-time sharing & analysis), real-time monitoring, map and image monitoring, power outage alarm notification, etc., to have sufficient data for the production.

Ms Lourdes S. Arciaga, Chief Science Research Specialist, Department of Energy, the Philippines: One of the major recommendations in the IRENA and FAO report in 2021 on Renewable Energy for Agri-food Sector is to have better data collection to guide renewable energy investments, improve access to finance for end-users and businesses, and a greater focus on awareness-raising and capacity building. Data collection can be undertaken through five (05) methods such as surveys, interviews, direct observations, focus groups, existing documents and records. Data collection can focus on resource assessment, land classification (varies from economy to economy), socio- economic data, institutional and political, and environmental factors. For example, in resource assessment, with a focus on solar energy, data such as irradiance, rainfall/cloud cover, electricity consumption, etc., can be important to help get an insight for investment in solar energy. Similarly, they can collect data about water discharge, gross head rainfall data, flood data, topography to invest in hydro power; feedstock sources, volume, price, transportation for biomass; geological data, steam production, physico-chemical data for geothermal energy; and so on. Regarding environmental factors, data such as water source, weather patterns,

typhoon path, soil profile would be helpful to obtain an overall landscape for more efficient investment.

5. Multi-stakeholders and access to finance to promote sustainable energy in agri-food value chains

Mr Vu Quang Dang, Independent Consultant, Viet Nam: Viet Nam has a number of opportunities when pursuing sustainable energy in agriculture given the fact that they have made strong commitments to net zero emission by 2050 focusing on two important pillars of energy and agriculture (forests). Viet Nam also has high potential for sustainable energy such as rooftop solar PV (good solar radiation, equipment price decrease), biogas (huge waste volume for additional energy and environment protection), wind energy, etc. Green energy requirements by end-users (such as the EU with the Carbon Border Adjustment Mechanism - CBAM) are also among factors that drive the efforts to pursue sustainable growth and development.

On the other hand, Viet Nam also encounter a number of barriers. Viet Nam has not yet well established carbon market and green taxonomy, which will be meaningful to support and facilitate all stakeholders to pursue sustainability. Small agri-enterprises might have limited awareness, information, technical capacity (energy audit, technical solution), and project development capacity to adopt sustainable energy in agriculture. The investment is costly while their finance capacity is limited since loan conditions are not favourable and customized for SMEs. Therefore, business themselves do not want to interrupt their operation for energy improvement.

It is proposed that finance should be improved to support the adoption of sustainable energy in agriculture. For example: customizing credit programs for SMEs with a focus on sustainable energy and environment protection in commercial banks; establishing a domestic Energy Efficiency (EE) Fund; facilitating access to climate finance programs and grants from international

donors; developing legal frameworks on energy service company (ESCO), energy performance contract (EPC), ESCO market, Direct Power Purchase Agreement (DPPA); etc.

Mr Edi Wibowo, Director of Bioenergy, Ministry of Energy and Energy Conservation, Republic of Indonesia: The Ministry of Finance administers various climate change financing initiatives and facilities, such as the Green Climate Fund, Environmental Fund Management Agency (BPDLH), and SDG Indonesia One. Besides, the Government have other funds such as the State Budget (Climate Change Mitigation and Adaptation Expenditure Account), Geothermal Sector Infrastructure Financing (PISP), Green Sukuk, Palm Oil Plantation Fund Management Agency (BPDPKS), Indonesia Climate Change Trust Fund (Bappenas), etc. They have incentives to encourage the utilization and developoment of renewable energy in agriculture such as tax allowance (reduction of 5% in income tax for 6 years); import duty exemption (2-year import duty exemption for machinery and equipment, additional minimum 30% 2-year exemption on raw materials for companies using local machinery and equipment); tax holiday (tax relief for 5 – 20 years, maximum income tax reduction of 100%), etc.

They also develop Agricultural People's Business Credit ((KUR) Pertanian) to provide credits to small farmers. KUR Pertanian is a government-backed credit facility for agricultural plant cultivation activities without the need for collateral, including building facilities to provide sustainable energy. KUR can be given to individuals, business entities and/or business groups that are productive and viable, but do not have additional collateral.

6. **Sharing experiences and case studies**

Mr GAO Yang, Program Officer, China Energy Administration: The speaker focused on the adoption of agriculture-complementary solar power, an emerging industry that integrates solar power generation, agricultural production, and

agricultural facilities, which significantly contributes to realising dual-use of land and water, pioneering a profit model of industrial diversification, ecological diversity, and multiple benefits; increasing farmers' income, promoting collective economic development and significantly enhancing farmers' sense of gain; as well as rehabilitating the ecological environment of the local farmland, and effectively promoting the construction of a local ecological civilization.

The new production pattern of agriculture-complementary solar power includes three forms of combination, namely: “PV + agriculture”, “PV + livestock and poultry industry”, and “PV + fishery”. In practice, “PV + agriculture” combines photovoltaic power generation with greenhouse cultivation, field planting, mushroom cultivation, tea garden, etc., effectively utilizing land under the photovoltaic array, and interspersed planting of crops to achieve compound land use. In particular, agriculture-complementary solar power can be applied in agricultural greenhouse after taking into full consideration of the characteristics of greenhouse and crops within the site, as well as the demand for photovoltaic power generation construction and the operational requirements of safety, durability and stability, which can ensure crop yield while providing a large amount of clean energy, creating favourable conditions for local facility agriculture development and industrial transformation.

“PV + livestock and poultry industry” combines photovoltaic power generation with animal husbandry. For example, in practice, by raising the height of photovoltaic brackets with a minimum height of 1.8 meters from the ground, it meets the needs of vegetation growth, ensuring enough grazing space for cattle and sheep. The project achieved organic integration with local animal husbandry. It provided a basis for clean energy, extended industrial development, promoted local employment and boosted the development of rural collective economy.

“PV + fishery” combines photovoltaic power generation with aquaculture, realizing the concept of “dual-use of land” and improving the proportion of low-

carbon energy in densely populated water areas. This combination achieves greater synergistic effects than the sums of its parts. For example, in practice, "PV + fishery" can employ a floating system with designated areas for fishing, photovoltaic arrays, feeding, and pond embankment, achieving multiple uses within one area.

Ms. Jenjira Gulphanich, Engineer, Department of Alternative Energy Development and Efficiency, Ministry of Energy: Thailand promotes the adoption of energy efficiency measures in small farms such as placing high-performance electric motors; installing variable speed motors used with the machine; installing heat pumps; replacing roof tiles; installing roof insulation; replacing ventilation fan; replacing biogas generator; installing evaporative cooling system; installing automatic control system; etc. For example, in a cattle dairy farm, they would promote the adoption of an automatic cattle data management system, installing solar power and solar water pump, changing the milking system. The automatic cattle data management system is reported to help Thailand's farmers save THB620,000 per year. Respectively, the installment of solar power and change of the milking system have saved THB125,560 and 757,062 per year, which is supportive to small farmers in enhancing their productivity and competitiveness.

IV. Discussion, Recommendations and Conclusions

Through the active sharing of information and experiences at the Workshop, speakers and participants exchanged views on how to promote small farmers' adoption of sustainable energy towards climate-friendly agri-food value chains. Recommendations are summarized as below:

1. Recommendations for small farmers

- Access and attend relevant training programs about smart agriculture projects.

- Work as a group of farmers or join up with a large-scale farm group or cooperative farm group to accumulate strength and advantages for increasing productivity and competitiveness.
- Access to government's policies, guidance, incentives and/or information to increase awareness, knowledge, capacity and skills to take advantages of their support.
- Collect important agricultural data as statistics in order to improve future smart farming.

2. Recommendations for APEC member economies/governments

- Raise the awareness of importance and benefits of sustainable agriculture as well as technology acceptance.
- Organize smart agriculture scheme such as training, subsidy schemes, pilot systems,
- More efforts to develop and disseminate low-cost and "easy to use" technology for farmers.

3. Recommendations for APEC

- APEC should leverage a platform to share knowledge on and/or disseminate technologies, innovation to promote small farmers' adoption of sustainable energy towards climate-friendly agriculture.
- APEC should strengthen collaboration and cooperation through sharing information, experiences, best practices, etc., to support member economies to develop more efficient and effective policies, frameworks and efforts in pursuit of climate-friendly agriculture.

Hereinabove are some recommendations from the workshop's participants and speakers that require further thoughts and discussions at the upcoming EWG meetings to transform into more concrete and practical activities.