Report on discussion in the field of "Realizing a Low Carbon Society through Conservation and Efficient Management of Terrestrial Ecosystems and Development of Utilization of Biomass"

1. Significance of research in this field

In order to develop through international cooperation necessary technology for economic growth in the East Asia Region as well as to realize a Low Carbon Society, we need to see that different characteristics in the Region such as industry and environment should be taken into consideration, to contribute to reducing carbon emissions, and also to be acceptable to the Region.

When we try to reduce carbon emissions dramatically in the East Asia Region, one of the most promising alternative options is effective utilization of biomass for materials and energy sources. Production of biomass per se does not depend on the consumption of fossil fuels, contrasting to other variety of materials such as concrete or plastics. Additionally, biomass can be converted to fuels and thus can significantly reduce carbon emissions by closing the carbon cycle --- the carbon released by the consumption of biomass fuels is reused to grow new fuels.

There are three issues to be considered when we promote biofuel production: energy profit ratio (EPR), carbon debt by land conversion and sustainability of biofuel crop production. Among them, the energy profit ratio is the primary criteria whether a certain option of biofuel production is at or close to the practical stage. We need to take different strategies for biofuels with sufficiently high EPR and those with less than or close to 1.

The emission effect caused by land conversion, so called carbon debt, is likely to be overlooked when people extol the virtue of the biofuel. Ignorance of this effect has brought about detrimental damages on vast area of terrestrial ecosystems in the region. Peatlands spread in the East Asia originally have served as storage for CO2 gas and reduce greenhouse gas effects. When developed for agriculture, peatlands work as sources of carbon emissions, because forests are being cut down and drains are being installed for growing oil palms on large scales, which lead to drying of peat soil and eventually result in natural oxidation or frequent fires. The current problematic situation of tropical peatlands caused by pursue of biofuel production should be solved by hands of those who involved in the promotion of the fruitful energy resources.

The last issue we have to consider is the sustainability of the biofuel crop production. The history of the biofuel crop cultivation is not so long to accumulate sufficient information on the sustainability of the yield under a variety of environmental conditions. Cultivation system should be low-input otherwise the GHG emissions through the whole production processes exceed the emission reduction expected from the substitution of fossil fuels by biofuel. Additionally, biofuel crop cultivation should be limited to the land with comparatively low productivity to prevent land

competition between food and biofuel crops. Thus sustainable cultivation management system of biofuel crops should be carefully investigated in terms of water management, nutrient management etc.

It is technologically very important to develop plants such as cassava or Jatropha which suit well to the climates in the Region and whose oil/fat or residues can be utilized as biofuels. This type of biomass utilization leads to outcomes that local communities can be revitalized.

In the technological aspects of biomass energy, scaled-up and cost-efficient production of renewable fuels, that is, combustion/gasification of biomass or conversion of biomass to liquid fuels, such as ethanol, bio-methane or bio-diesel is essential. The demonstration of scalability will thus be a key requirement of successful biomass fuel projects. In this case, biomass should include biomass-waste.

In case we should also include, as our viewpoint, a solution to a long-term issue for utilizing biomass, the most significant scientific challenge would be to increase efficiency of biomass photosynthesis which can be included in our technological areas as a basic research.

2. Necessity of International Collaboration and Expected Synergistic Effects

In the East Asia Region, there are different ways for utilizing lands, with different plants and different cultivation styles. Similarly, there are also different engagements for producing biofuels. Moreover, all participating countries and research organizations listed below have their own specific advantages, for example, utilization of Jatropha, waste recycling for fuel, and reservation of peatlands. An important thing is that none of the topics raised at the discussion can be covered entirely by a single country. Thus combination of expertise is a key element for successful implementation of biomass energy projects.

On the other hand, the technical platform is common between conservation and management of cultivated lands and development of biofuels. These technologies can be jointly developed by multinational cooperation and shared as a "system technology", so that selecting the most appropriate plants and cultivation styles in accordance with regional characteristics and producing biofuels out of oil/fat or residues would be possible. Countries can collaborate to build an international network for production of bioenergy and to achieve economic development and sustainability at the same time in the Region.

3. Identified Areas for Cooperation

Through the Science Talk on biomass, we identified four possible compositions of research topics and prospective participating countries. These topics need to be formulated into projects aiming at next generation of technology, which shall also be in accordance with the technological development presently being conducted in different parts in the Region.

Specific S&T research topics and interested countries are as follows:

- (1) Bio-diesel or use of energy from Biomass, such as Jatropha: Japan, Cambodia, Indonesia, Philippine, Lao PDR and Thailand
- (2) Peatland Preservation and Re-forestation: Brunei Darussalam, Cambodia, Indonesia, Japan and Thailand
- (3) Energy from Biomass Waste: Japan, Brunei Darussalam, Cambodia and Lao PDR
- (4) Energy from Micro Algae: Japan, Philippines and Thailand

The topic (1) should include research activities not only in energy production but also in production of fertilizer from waste as well as water and nutrient management of the cultivation system.

The topic (4) could include not only exploration of micro algae with high performance but also development of biological and biochemical methods that can be used to create more efficient species for biomass products. Thus there was a comment in the Talk that this topic needs long-term cooperative research activities.

Participants to the Science Talk on biomass energy are as follows.

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- Japan
 - a) Prof. Koichi Yamada, Deputy Director General, Center for Low Carbon Society Strategy (LCS), Japan Science and Technology Agency (JST)
 - b) Prof. Akihiko Kondo, Biochemical Engineering Laboratory, Graduate School of Science and Technology, Kobe University
 - c) Dr. Mariko Norisada, Assistant Professor, Asian Natural Environmental Science Center, the University of Tokyo
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