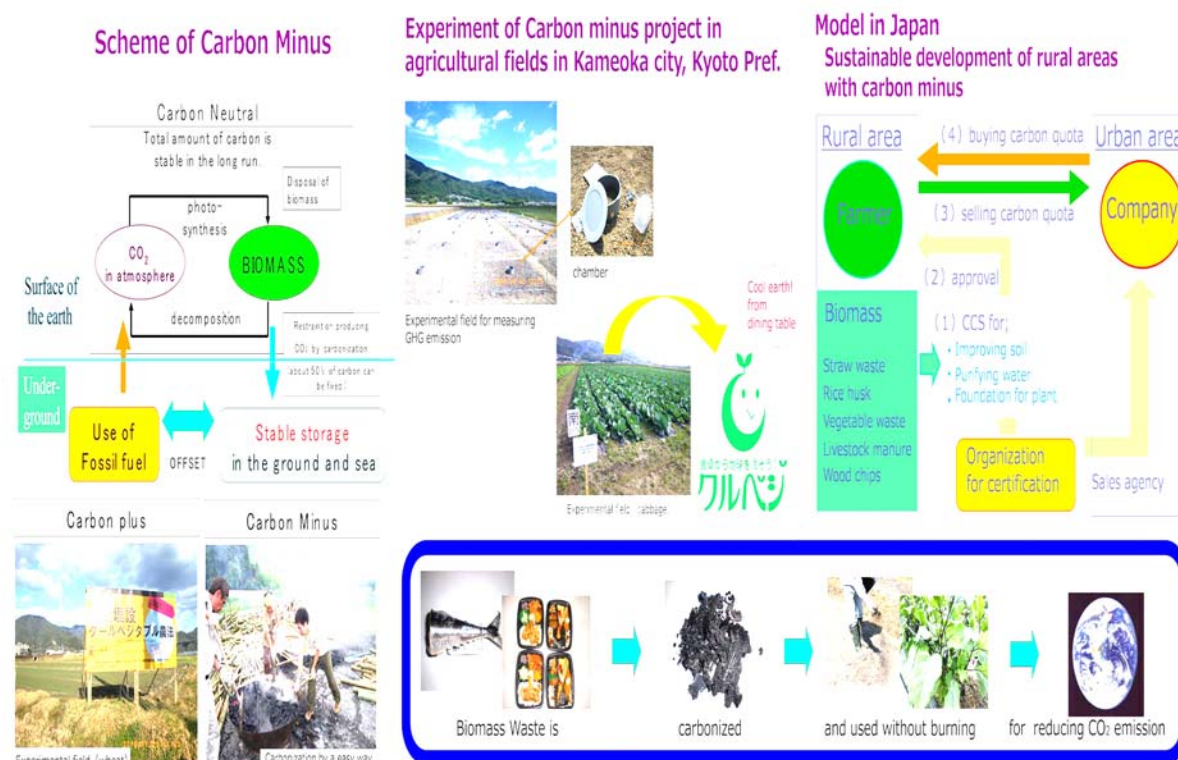


## A Trial and Practical Study on Carbon Minus Project for Mitigating Climate Change Using by Biochar

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As long as we continue to use fossil energy, the absolute volume of carbon flow on the surface of the earth is increasing continuously (carbon plus). It is one of the good ways to use biomass energy as carbon neutral material instead of fossil energy for mitigation of atmospheric CO<sub>2</sub> density. Thereupon, it is better aggressive way to adopt carbon sink (carbon minus) using biomass carbonization. Carbonization of biomass is a simple method to fix carbon from atmospheric CO<sub>2</sub>. When using char made from biomass (bio-char) to apply to croplands physically without any incineration like as soil improver, it brings the reduction of the density of atmospheric CO<sub>2</sub>. In order to precede biomass carbonization system as carbon minus, it is essential to produce char in low cost and to use char physically. Difficulties of biomass carbonization are large water content and logistics like as collecting and delivery. Therefore it is a better method to combine compost and carbonization to produce bio-char in order to decrease water content, and to collect biomass as raw material within the limited territory to minimize the logistic cost. Besides carbon emissions trading through burying bio-char in croplands can assist its cost performance. This carbon emissions trading makes circulation of money to agricultural sectors from industrial sectors. Considered is the policy mix scheme of adaptation to climate change through biomass

carbonization and development of rural and urban areas.

This study demonstrates the carbon minus project implemented in Kameoka City, Kyoto. This project, focusing on the carbon in the biomass waste that has been emitted as CO<sub>2</sub> into the atmosphere through burning and decomposition, aims to construct systems of offset for CO<sub>2</sub> that has been increasing in the atmosphere by burning-use of fossil fuel. The study, funded by Daiwa House Industry co. Ltd, estimated the effect of CO<sub>2</sub> reduction by introducing carbon minus to its three of group companies. Through the introduction of the carbonization and the carbon storages (carbon minus), such as wood scraps from construction sites and food residues, it was estimated that the amount of 60,000 ton of CO<sub>2</sub> reduced, which corresponded to about 50 percent of the amount of CO<sub>2</sub> emission per year from waste management. In addition, this amount of reduced CO<sub>2</sub> is equivalent to economic benefit of 260 million JPY if this system is adopted in the EU emission trading market (CO<sub>2</sub> emission price: 4,281JPY/ton-CO<sub>2</sub>, as of 6th June, 2008).

This study proposes one possible model of carbon emissions trading in Japan for sustainable development of rural areas with carbon minus. In this model,

- 1) biomass, such as straw waste, rice husk, vegetable waste, livestock manure and wood chips, is carbonized and made use for improving soil, purifying water and foundation for plant which is thought as CCS (Carbon Capture and Storage);
- 2) if organizations for certification approve this first procedure as CCS, farmers get carbon quota equivalent to the amount of reduced CO<sub>2</sub> by their CCS process;
- 3) the farmers can sell their carbon quota to companies, then;
- 4) industrial companies which needs more carbon quota than given can buy the proposed quota by the farmers.

This model shows a circulation of money from industrial sectors to agricultural sectors under the balance between environment- and economy-friendly. The study finally suggests this is a mitigation strategy in human, societal and economic dimensions for climate change.

Keywords: Carbon Minus, Biochar, Cool Vegetable Farming, CCS