EVALUATION OF ENVIRONMENTAL LOAD RELATED TO FRIUTS AND VEGETABLES CONSUMPTION BY HYBRID LCA METHOD: JAPANESE CASE STUDY

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Recently, fruits and vegetable consumption is shifting to year-round consumption. This trend could increase environmental load by higher fossil fuel consumption in greenhouse cultivation and extension of food mileage. When considering sustainable fruits and vegetable consumption, we must evaluate life cycle of consumption, however, inventory data in all stages of the life cycle have not covered certain amount of Japan's all fruits and vegetable consumption.

This study aims to obtain an in-depth understanding of the environmental load caused by the fruits and vegetables consumption in Japan. We estimated the quantity of direct and indirect greenhouse gases (GHGs) and acidifying substances (ASs) emissions for 24 different kinds of fruits and vegetables at different seasons and producing countries(domestics and imports from U.S.). We implemented our inventory analysis of production stage mainly based on a hybrid LCA method using environmental I-O data and production cost data both in Japan and U.S. We also consider each stage of consumption: shipment, transportation, retailing, food preparation, and solid waste treatment. Then we compared environmental efficiencies of fruits and vegetables as environmental load per vitamin and mineral content by multiple cooking processes.

In our estimated results, total GHGs emission from domestically produced fruits and vegetables in Japan (2003) was nearly 12.7 million tons (CO_2 equivalent) in which 65% of the total was from production and 16% was from transportation. GHGs and ASs from greenhouse crops were higher than those from garden farming crops. In terms of GHGs, environmental efficiency (vitamin C) was relatively high in mandarin oranges and green peppers growing outside and cabbage. In comparison of producing countries, GHGs emission from onions, which Japan imports most in fresh vegetable from U.S., is affected largely by transportation stage. In the case of GHGs emission from tomatoes, which is cultivated in greenhouse in winter, seasonal effect of production stage exceeds the effect of transportation distance.

(307 words)