

Evaluation of the Recycling of Biomass Resources Using the Waste Account

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1. Objective

Some biomass resources are used for agricultural production, and are recycled as materials of other activities, such as compost made from livestock manure or rice plant straw used for litter. However, these activities are not revealed in economic statistics because of bartering and trading without any monetary charge. It is necessary to properly understand transactions of biomass resources in the agricultural sector.

The purpose of this study is to propose an account for evaluating biomass resources used in the agricultural sector, as well as to understand the status of wastes and environmental impact arising from agricultural production activities.

2. Methods

The waste account can be adapted to the case of the agricultural sector to grasp the status of transactions of biomass resources. It can also show the amount of environmental impact arising from agricultural production, in addition to the amount of biomass resources and their disposal and recycling.

The agricultural waste account covers overall agricultural production in Japan. However, the conditions of waste and environmental impact in each region must be understood. Waste arising from agricultural production depends on the characteristics of the region. Therefore, the agricultural waste account is arranged to reflect regional characteristics.

As an example of the use of information obtained from this account, reducing

environmental impact is estimated when imported rice plant straw is substituted for domestic supplies. It is estimated both in the case of overall Japan, where there is not considered to be a regional straw supply constraint, and in the case of considering a regional straw supply constraint.

Waste items, which are evaluated in the account, are livestock manure and corpses, which are generated by cattle, pigs and poultry, rice straw, and plastic waste. 11 items of environmental impact are estimated in the account; SPM, NO_x, SO_x, CO₂, CH₄, N₂O, NH₃, T-N, T-P, BOD and COD. The estimated year is the 2000 calendar year. To understand the differences among regions, all of Japan is divided into 9 regions.

3. Outline of the results

By adapting the waste account, the physical flows and transactions of biomass resources concerning about the agricultural sector are shown clearly.

The results of the analysis are 1) Environmental impact reduction due to reduction of burnt straw is 2,089 ton-SPM, 1,572 ton-CH₄ and 25 ton-N₂O in the case without regional constraint of straw supply (Table 1), 2) When considering the regional constraint of the straw supply system, the effect is reduced to 71% of the total, and Chubu shows the largest effect of environmental impact reduction (Table 2).

Table 1. Change in environmental impact due to straw substitution

| | Recycled straw (1,000t) | Disposed straw (1,000t) | SPM (t) | CH ₄ (t) | N ₂ O (t) |
|---|----------------------------|----------------------------|------------|------------------------|-------------------------|
| Before substitution | 11,497.1 | 551.5 | 4,251.7 | 3,000.5 | 102.4 |
| After substitution | 11,768.1 | 280.5 | 2,162.7 | 1,429.0 | 77.2 |
| Change | 271.0 | -271.0 | -2,089.0 | -1,571.5 | -25.3 |
| Per production value (kg/10 billion yen) | — | — | -632.0 | -475.4 | -4.9 |

Table 2. Change in environmental impact with regional straw supply constraint

| | (kg/billion yen) | | |
|----------|------------------|-----------------|------------------|
| | SPM | CH ₄ | N ₂ O |
| Hokkaido | -170.4 | -128.2 | -1.3 |
| Tohoku | -10.3 | -7.8 | -0.1 |
| Kanto | -174.3 | -131.1 | -1.4 |
| Chubu | -520.0 | -391.2 | -4.0 |
| Kinki | -474.5 | -357.0 | -3.7 |
| Chugoku | -17.0 | -12.8 | -0.1 |
| Shikoku | -303.5 | -228.3 | -2.4 |
| Kyushu | -343.2 | -258.2 | -2.7 |
| Okinawa | -52.2 | -39.3 | -0.4 |
| Average | -229.5 | -172.6 | -1.8 |
| Total | -2,065.4 | -1,553.7 | -16.1 |