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# ECONOMICS AND ISSUES OF BIOMASS POWER GENERATION IN JAPAN -- COMPARING FOOD WASTES AND WOOD WASTES FROM SCRAPPED HOUSES --

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## OVERVIEW

The first commitment period of Kyoto Protocol enters in the center year of 2010. The utilization of biomass residues is one of the most important options for achieving Japan's Kyoto target in the first period in Japan. In the previous studies, we analyzed the economics of power generation using food wastes [1] and wood wastes from scrapped houses [2]. In this study, we would like to compare the economics of both power generations. We would like to pay our attention especially to the relation between the scale of power generation plant and the gathering method and cost of biomass residues. We also would like to focus on the differences on the gathering method of both wastes. In addition, we would like to discuss various issues to expand effective uses of biomass residues in Japan.

## METHOD

We developed simulation models for estimating benefits and costs of power generation using both wastes by using surveyed studies [3] and [4]. First, we calculated the economics of power generation using each simulation model and then sorted out calculated results from both simulation models. Second, we compared calculated results obtained by changing several parameters such as size of gathering area, density of gathering points, gathering charge, scale of power generation plant, operation rate of plant, selling price of electricity, government subsidy and so on. Third, we specified characteristics of power generation using each wastes based on these simulation results from various kinds of viewpoints. Finally, we discussed key issues for the sake of expanding effective use of biomass wastes in Japan.

## RESULTS

The following results are obtained in this study (See Fig.1).

+ First, we compared the various costs of power generation by changing size of gathering area and density of generating points of wastes. Because the scale merit works on depreciation cost and operating cost of both power generations, these costs become lower as the input size of power plant becomes larger. However, both of depreciation cost and operating cost on food wastes are higher than those on wood wastes. As shown in Fig.1, the gathering cost shows the largest difference between both power generations.
+ Second, we also compared the net profit of both power generations. In the case of food wastes, the good economics of power generation is not obtained as it is, because the net profit is negative even in the high density case. The economics becomes worse in the middle density and low density cases. In the case of food wastes, there is the most suitable input size which can maximize profitability, because the gathering cost increases more as

the input size of plant becomes larger, while the scale merit works stronger, as shown in Fig. 1. On the other hand, in the case of wood wastes, the gathering cost is almost the same in each density case. Therefore, the economics of power generation plant improves more as the input size of plant becomes larger due to the scale merit.

+ Finally, we compared the support measures to both power generations. In the case of food wastes, the support measures to improve economics are required even in the high density case. The economics of power generation using food wastes turns to positive by adding more than 50% subsidy of construction cost or +6,000 Yen / ton support of gathering charge on food wastes. But the economics can not improves to positive without electricity purchase price more than domestic electricity charge of 23 Yen / kWh. In this sense, it is quite difficult to apply a single support measure for improving the economics of power generation using food wastes. The combination of support measures, for example 30% subsidy of construction cost and +3,000 Yen / ton support of gathering charge on food wastes, is required as a concrete measure. On the other hand, in the case of wood wastes, the support measures to improve economics are required from the middle density case. The economics of power generation using wood wastes improves considerably even by adding a moderate single measure such as 30% subsidy of construction cost, +1,000 Yen / ton support of gathering charge on wood wastes or +1.5 Yen / kWh support of electricity purchase price.

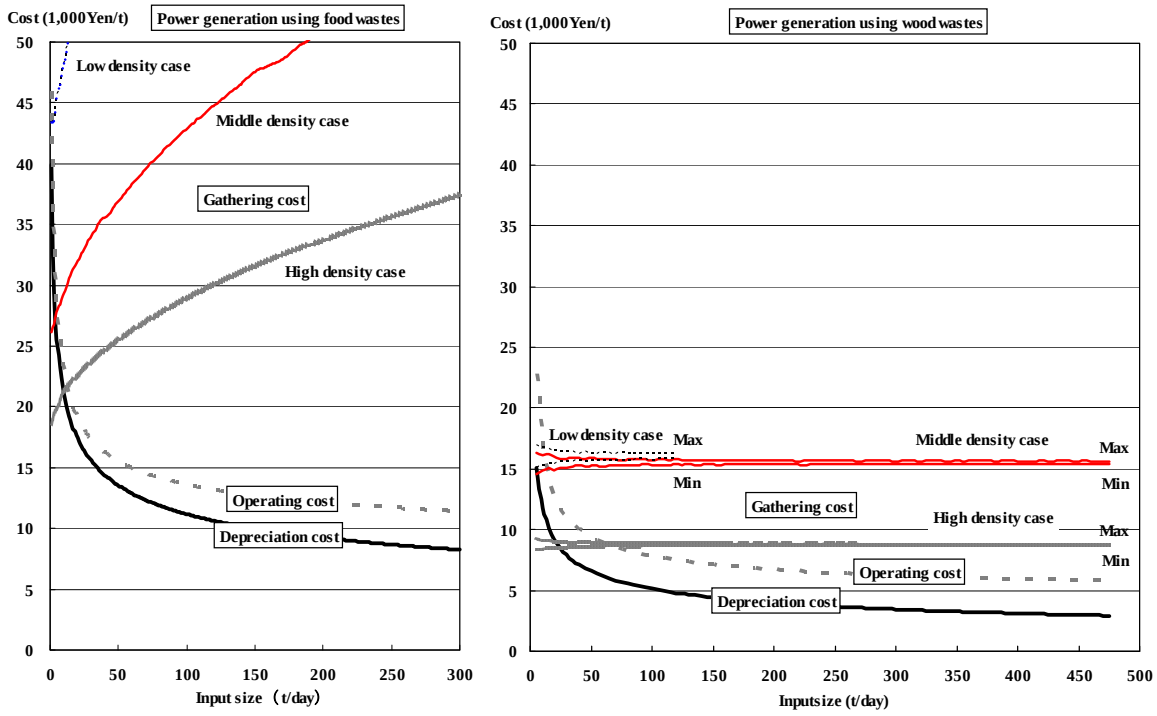


Fig. 1 Comparison of various costs between power generation using food and wood wastes

## CONCLUSION

The conclusions of this paper are as follows:

+ Based on the analyzed results on both power generations in this study, we can find that the gathering process of input materials for power generation plays a quite important role on the economics of power generation
+ For the sake of expanding effective uses of biomass wastes, it is reasonable for us to adopt simple power generation using direct burning without complex processes such as gasification by methane fermentation.

+ Japan also needs to consider the elimination of several barriers and problems and to make support measures in order to improve the economics of power generation using biomass wastes.

## REFERENCES


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