



Summary of the report on Sustainable Agriculture and Biomass

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Introduction

Three approaches on sustainable agriculture using biomass:

- Small-scale biomethanation -- Thailand
- Jatropha plantation -- Indonesia
- Large-scale ethanol production -- China

This presentation is the general discussion based on the obtained results and discussion on each approach.

Farmer's standard of living

There are mainly two ways to support farmers.

- Cheap energy supply
- Increasing income

Farmer's standard of living—energy

In Thailand, small scale biomethanation provides cooking gas to farmers, thus they need not buy propane gas for cooking.



Farmer's standard of living—energy

In Indonesia, farmers in the rural area do not have access to electricity nor propane gas, and no light is available. Jatropha oil could be used for cooking fuel as well as lamp fuel so that fossil fuel consumption is prevented.



Farmer's standard of living—energy

This support to farmers is also effective for sustainable agriculture due to the reduction of fossil fuel utilization.

This utilization may be opportunity one. Namely, it compensates needed fossil fuel for the future development.

Farmer's standard of living—income

The other support is by cash. In China, rural farmers have access to electricity grid, but do not have money to buy the electricity. When they grow feedstock for ethanol production, and sell it at a high price, with the indirect support from government, they get money for buying electricity.

Since those who use ethanol as fuel are richer compared to farmers, and this mechanism can be considered as “re-distribution of wealth”. In this case, however, sustainability of their plantation and competition with food production is to be considered.



Farmer's standard of living

In terms of improving farmers' standard of living, all of the three approaches investigated in this study were found to be effective.

However, It is to be noted that Jatropha production was just started, and more information is needed before finally deciding its effectiveness.

Accessibility to the biomass plant

Accessibility of the biomass plant or biomass collecting site is important.

- Small scale biomethanation in Thailand is desirable since the farmers can use the cattle manure in their own farm, and the product gas can be used for their own purpose.

- For the case of jatropha plantation, they were considering of distributing cheap jatropha oil mills at the jatropha plantation sites so that the farmers could get oil.

- In China, the farmers organized a co-operative union that collects feedstock and provide to the large-scale ethanol plant.

Education

Another important aspect is the education.

For the case of Thai small-scale biomethanation, its effectiveness is highly evaluated. However, the farmers do not know this technology, and thus the distribution of the technology is very limited.

According to Prof. Liu, Tsinghua University, this kind of technology is also effective for Chinese farmers.

Education can be an important task that Japan can contribute in the next step.

Biodiversity

For large scale plantation, biodiversity is to be considered.

- For ethanol production in China and jatropha production in Indonesia, the possible land to be used is semi-arid land or the cultivation is by intercropping.
- In Thailand, land area that can be used for agricultural purpose is limited.

In this way, the biodiversity problem can be avoided.

Conflict with food production

The conflict in land use with food production is a large problem. Even in China, ethanol production from crops is to be limited. Thus, technology development for ethanol production from lignocellulosic materials is important.

Price of technology

Of course the technologies to be used should be cheap ones. The farmers are not always rich.

Small-scale biomethanation and jatropha production are desirable for this point.

Conclusions

The three technologies investigated in this study are all effective for improving farmers' **standard of living**. They can be also effective in terms of **sustainable agriculture** since they lead to reduction of fossil fuel use in rural area. However, detailed LCA calculation is needed for jatropha and ethanol production. Sufficient information was not available for jatropha because the study has just begun. The LCA effectiveness of ethanol production is still controversial all over the world, and the detail study is needed for each case.

The reduction in **biodiversity** is avoided by intercropping or using semi-arid lands. What is important for prevailing these technologies are farmers' **accessibility** to the biomass utilization or collection site and **education**.



Thank you!!