Chapter 4

Framework of a "Decision Support Tool"

Sustainability Assessment of Biomass Utilisation in East Asia Working Group

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CHAPTER 4

Framework of a "Decision Support Tool"

1. Introduction

In the processing of bioenergy feedstocks, the private sector often makes the decisions, which causes uncertainty in reaping the benefits of bioenergy. Public and private decision makers are likely to have different concerns. Private decision makers often focus on economic returns, while leaving out social and environmental issues as externalities, because these are impacts that do not appear in private companies' accounting systems. Public decision makers, on the other hand, are supposed to take social and environmental aspects into consideration.

Whether or not bioenergy development can deliver the desirable results depends on an institutional settlement, which should be set by Government. Once the appropriate regulations are in place, externalities would be internalized, and thus the private decisions would be as inclusive as public decision. Decision makers therefore face the challenge of setting the right institutional regulations to make sure that private decisions will deliver results consistent with national policy and public interest. To maximize benefits and minimize risks from the development of bioenergy, policy makers at all levels need to understand the potential impacts of various investment proposals when they are deciding bioenergy development strategy or approving investment options.

To make an appropriate regulatory regime, Government needs to understand the potential impact of bioenergy development before the development activities take place. The ERIA sustainability assessment method, which is good for post-project evaluation, can also be used for this ex-ante assessment. In the ex-ante case, the assessment method serves as a decision support tool for decision makers to decide which option would be in their best interests. The tool will calculate a variety of indicators in economic, social and environmental aspects for each option. Such calculations rely on a hypothetical scenario for each option. Data for the calculation will come from the literature, or pilot testing. However, it should be noted that it is unlikely that all three aspects would give the same preference and thus trade-offs would have to be made by the policy makers.

This chapter will illustrate how the ERIA WG methodology can be used for supporting ex-ante assessment. An illustrative example will be presented to demonstrate how the methodology is applied. After this introduction, the next section (Section 2) will discuss the framework of the decision. Section 5 presents a demonstrative case study on choosing the best option to dispose empty fruit bunches (EFB) of oil palm in Malaysia.

2. The Framework

In applying the methodology, some issues have to be defined before the tool can be used. The first would be policy objectives. If reasonable options have to be specified, then these options would be the targets of the tool. At the technical level, a boundary of the assessed system has to be decided.

2.1. Defining Policy Objectives

There are two frequently-discussed policy targets. The first is effective optimization of the use of an existing piece of land to obtain bioenergy. The second is efficient disposal of biomass, in particular, waste from bioenergy production.

Policy makers need to decide which bioenergy crops should be planted on a particular land area after they decide to develop bioenergy feedstocks on that land, since there is a large variety of feedstocks. Such issues could be faced by both governments and NGOs. Governments usually need to make such decisions on a large area of land, as in the case of industrial planning. However, in many countries, such decisions are made by the private sector. Governments, however, still needs to understand the issue in order to set the regulatory system.

In the case of bio-waste disposal, the government also needs to assess sustainability in order to set the right regulatory framework and incentives which will lead the private sector to move to the desirable direction.

2.2. Identifying Options

For every policy target, there are numerous potential options. However, considering the limitations of time, financial resources, and for other reasons, decision making has to be based on limited options. There should therefore be a step to identify candidate options. For example, in the case of producing bioenergy carriers from a given land area, the master options would be different kinds of feedstocks.

It should be noted that these options do not represent all the possible real scenarios. For example, even for a given feedstock, the use of different amounts of fertilizer will lead to different emission results. We should also therefore decide the level of aggregation of options, to avoid being swamped with details. Usually, in each master option, the WG suggests the use of an average or standardized scenario. For example, the use of fertilizer will be assumed to be at a certain level so that it will not cause different emissions results. This has a real advantage, in that we do not need too many details. Some details, such as exactly how much fertilizer could be used, would be useful but not cost-effective, since they will not provide additional information for choosing the right option.

The standardized scenario is particularly important for the feedstock processing step, with different scales of factory, different amount of capital investment, etc. All the differences will lead to differences in processing costs. It is recommended that some standardized factory be assumed, which will be represented as constant process costs.

2.3. Defining System Boundary

In order to calculate TVA, the boundary of the project has to be defined properly, because if the production chain extends, the TVA will surely grow. For example, in the case of disposing of empty palm-fruit bunches (EFB), if board made from EFB is further used to produce furniture, the TVA will become larger. The TVA approach will always prefer a longer production chain to a shorter one. Moreover, the value of the furniture will not be able to be standardized, since the prices of the furniture could be very diverse due to factors such as brand and types of furniture.

For the calculation of GHG emissions, the boundary setting is also important. A different boundary setting will lead to different GHG emissions. For example, the GHG emissions vary greatly with whether more downstream processes are included or whether the produced biomaterials substitute the existing materials. It should be carefully checked that the system boundary as defined gives an appropriate answer to the target of the study. Similarly, for calculating social indicators, boundary definition also matters. Therefore, clear, transparent and reasonable definitions of the project boundary are essential.

2.4. Application of Indicators

Following the ERIA WG methodology, the decision tool should have three aspects: environmental, economic and social. However, considering the many differences between ex-ante forecasting and post-project evaluation, the following points should be noted in applying the indicators of the ERIA WG methodology.

2.4.1. Environmental Indicator

The WG environmental sustainability indicator, life cycle GHG emissions, will remain valid in ex-ante assessments.

In all these three aspects, calculations may be simplified by omitting the common parts of the biomass utilization value chain across all options, if the assessment focuses only on comparison between options. For example, land preparation can be omitted in the case of selecting bioenergy feedstocks for a given land area. In this case, the evaluation needs to focus only on what is relevant for comparison purposes; that is the differences between the options.

2.4.2. Economic Indicator

It is more practical and feasible to use the production approach than the income approach. One advantage of the production approach over the income approach is that, in the ex-ante decision, disaggregated data for TVA, including labor costs and profits, are not available. It is thus not possible to calculate TVA using the income approach. For the production approach, on the other hand, we only need the costs of intermediates, which are available in the market.

In the case of applying the production approach, where the production chain is relatively straightforward, it can be assumed that there is an integrated company, which can produce bioenergy carriers from land. Such a vertically integrated company will have control of the whole supply chain for bioenergy, including plantation, processing and sales. The production approach thus will not consider costs occurring inside the company, such as processing costs. Instead, it needs to subtract the value of goods and services bought outside the company (these are intermediate goods) from the final sales values. It should be noted that land, labor, and capital are primary inputs, which are not included among intermediate inputs[1].

2.4.3. Social Indicator

Employment generation is a relevant and suitable social parameter. The employment generated by a bioenergy project may be different for various biomass feedstocks. It is, therefore, necessary to assess the labor intensity (person hours generated per unit of land). Practically, it is important to find out how many more jobs can be created by each type of feedstock.

3. Interpretation of Results

In general, the three indicators may not necessarily give the same preference. If that happens, policy makers need to decide trade-offs among the three indicators. Unfortunately, the assessment methodology itself cannot help very much in suggesting a weight among the three aspects, because that will depend on the priority of the decision makers in each case.

[1] In the production process, intermediate goods either become part of the final product, or are changed beyond recognition in the process. In other words, intermediate goods must be consumed during the production process.. Source: ILO, IMF, OECD, Eurostat, UNECE, World Bank, 2004, Producer Price Index Manual: Theory and Practice, International Monetary Fund, Washington DC.