EVALUATION OF THE POTENTIAL OF JATROPHA IN THE CLEAN DEVELOPMENT MECHANISM

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ABSTRACT

The purpose of the study was to identify and evaluate potential activities that reduce GHG gases through the use of jatropha biofuel and jatropha plantation. It was conducted through a scenario analysis considering an optimistic/conservative parameter based in the yield of the jatropha’s oil production (oil ha/year). For each of those scenarios was calculated the amount of GHG reductions and expressed in CERs. Likewise it was identified the suitable conditions for CDM projects in the countries studied (Malaysia, Chile and New Zealand).

The approach used in the study was carried out through analysis of data under an optimistic and conservative scenario based on the yield of the jatropha’s oil production (oil ha/year) and collection of primary and secondary data and existing literatures on biofuel and CDM projects in order to cover all the objectives.

The main greenhouse reduction is through the use of jatropha biofuel replacing diesel in the transport sector; however other sub-products from the seed cake and seed oil can reduce greenhouse gases through the replacement of fossil fuel. Jatropha meet the requirement for an Afforestation/Reforestation (A/F) CDM project in terms of minimum land area, tree crown cover and height. It will be considered an A/F project as long as the plantations are established in degraded or deforested lands. The carbon stock per hectare CO$_2$ (tonnes) varies per year in the methodology used. From the results it can be seen that the total in a period of 10 years is 2,091,000 CO$_2$ (tonnes) considering 20,000 hectares of jatropha. Malaysia and Chile were considered to be the developing countries and the conditions to make the project suitable vary according to climate conditions, land availability, additionality criteria, sustainability of the project, ownership of the carbon credits, the monitoring process and fossil fuel prices. An
estimation of the amount of reduction emission or certified emission reductions (CERs) was conducted according to a conservative and an optimistic scenario related to the tonnes of biodiesel produced. The emissions of the baseline in the conservative scenario are 807,560 CO$_2$ (tonnes/year) while the emissions in the optimistic scenario are doubled. Jatropha biodiesel emissions from the process were considered in terms of fossil fuel and electricity consumption, use of nitrogen fertilizer and methanol used at the transesterification process. The total in the conservative scenario was estimated as 47,441 CO$_2$ (tonnes) and the emission in the optimistic scenario was doubled. Finally, the emission reduction was 760,119 CO$_2$ (tonnes) in the conservative scenario and double in the optimistic scenario. An estimation of carbon credit profit was carried out according to a conservative price on the current markets.

The practical implications for this study is the potential for jatropha biodiesel to be a CDM project, as long as the plantation and production of biodiesel are carried out in an environmentally sustainable way, using organic fertilizers, in order to prevent the GHG emissions from the project being more than the reduction itself. Governments and private sector should take steps towards investing in agriculture for the production of jatropha crops and establishment of biofuel processing plants.

This research is a preliminary analysis of the potential economic and environmental benefits that can bring the adoption of biofuels in countries such as New Zealand, Chile and Malaysia. This analysis has opened up the focus of the bigger study for the adoption of biofuel and their implications in terms of sustainability and GHG reduction initiatives.

**Keywords:** CDM, jatropha, biofuel, carbon credits, Kyoto Protocol, greenhouse gas emission.
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### LIST OF ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tr>
<td>A/R</td>
<td>Afforestation/ Reforestation</td>
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<tr>
<td>B1, B2…B99</td>
<td>Blended biofuel with diesel in percentage of 1, 2…99.</td>
</tr>
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<td>CDM</td>
<td>Clean Development Mechanism</td>
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<td>CERs</td>
<td>Certified Emission Reductions</td>
</tr>
<tr>
<td>COP</td>
<td>Conference of Parties</td>
</tr>
<tr>
<td>DNA</td>
<td>Designated National Authority</td>
</tr>
<tr>
<td>DOE</td>
<td>Designated Operational Entity</td>
</tr>
<tr>
<td>EU</td>
<td>Europe Union</td>
</tr>
<tr>
<td>ETS</td>
<td>Emission Trading Scheme</td>
</tr>
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<td>FRIM</td>
<td>Forest Research Institute Malaysia</td>
</tr>
<tr>
<td>GHG</td>
<td>Green House Gases</td>
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<tr>
<td>IDI</td>
<td>Indirect Injection</td>
</tr>
<tr>
<td>LULUCF</td>
<td>Land-Use, Land-Use Change and Forestry</td>
</tr>
<tr>
<td>LCA</td>
<td>Life Cycle Assessment</td>
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<tr>
<td>NEECS</td>
<td>National Energy Efficiency and Conservation Strategy</td>
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<tr>
<td>NZ</td>
<td>New Zealand</td>
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<tr>
<td>NZTS</td>
<td>New Zealand Transport Strategy</td>
</tr>
<tr>
<td>OECD</td>
<td>Organization for Economic Cooperation and Development</td>
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<tr>
<td>PIN</td>
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</tr>
<tr>
<td>POME</td>
<td>Palm Oil Mill Effluent</td>
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<td>Pure Plant Oil</td>
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