

**EVALUATION OF THE POTENTIAL OF JATROPHA IN THE CLEAN  
DEVELOPMENT MECHANISM**

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**FACULTY OF SCIENCE  
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DEVELOPMENT MECHANISM**

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**FACULTY OF SCIENCE  
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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<sub>2</sub> (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<sub>2</sub> (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<sub>2</sub> (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<sub>2</sub> (tonnes) and the emission in the optimistic scenario was doubled. Finally, the emission reduction was 760,119 CO<sub>2</sub> (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.

## TABLE OF CONTENTS

<b>ACKNOWLEDGEMENTS</b> .....	<b>III</b>
<b>ABSTRACT</b> .....	<b>IV</b>
<b>LIST OF TABLES</b> .....	<b>X</b>
<b>LIST OF FIGURES</b> .....	<b>XII</b>
<b>LIST OF EQUATIONS</b> .....	<b>XIII</b>
<b>CHAPTER 1</b> .....	<b>1</b>
<b>1 INTRODUCTION</b> .....	<b>1</b>
<b>CHAPTER 2</b> .....	<b>7</b>
<b>2 LITERATURE REVIEW</b> .....	<b>7</b>
<b>2.1 Biofuels</b> .....	<b>7</b>
<b>2.2 Jatropha</b> .....	<b>11</b>
2.2.1 Uses of Jatropha .....	14
2.2.2 Jatropha and Greenhouse Warming .....	15
<b>2.3 Clean Development Mechanism</b> .....	<b>16</b>
2.3.1 Project Cycle .....	18
2.3.2 Afforestation and Reforestation (A/R) .....	19
<b>2.4 New Zealand and Climate Change</b> .....	<b>20</b>
<b>2.5 New Zealand and Biofuel</b> .....	<b>23</b>
2.5.1 Use of Biofuel in New Zealand .....	25
2.5.2 Barriers to the Introduction of Biofuels .....	25
<b>2.6 New Zealand and Forest</b> .....	<b>27</b>
<b>2.7 Chile and Climate Change</b> .....	<b>29</b>
<b>2.8 Chile and Biofuel</b> .....	<b>31</b>
<b>2.9 Chile and Forest</b> .....	<b>32</b>
<b>2.10 Malaysia and Climate Change</b> .....	<b>34</b>
<b>2.11 Malaysia and Biofuel</b> .....	<b>36</b>

<b>2.12</b>	<b>Malaysia and Forest.....</b>	<b>38</b>
<b>2.13</b>	<b>Case Studies on Jatropha Biodiesel .....</b>	<b>42</b>
2.13.1	Manufacture of Biodiesel from Crude Palm Oil and Jatropha Oil in Kakinada, Andhra Pradesh.....	43
2.13.2	Jatropha Biodiesel from Degraded Land in Madagascar .....	44
2.13.3	Jatropha curcas Cultivation in the Democratic Republic of Congo.....	46
<b>2.14</b>	<b>Summary of Chapter 2.....</b>	<b>47</b>
<b>CHAPTER 3</b>	<b>.....</b>	<b>50</b>
<b>3</b>	<b>METHODOLOGY.....</b>	<b>50</b>



<b>CHAPTER 4 .....</b>	<b>54</b>
<b>4 RESULTS AND DISCUSSION FOR QUALITATIVE FINDINGS.....</b>	<b>54</b>
<b>4.1 Identification and Evaluation of Potential Activities that Reduce Greenhouse Gases through the Use of Jatropha Biofuel and Sub-products.....</b>	<b>54</b>
4.1.1 Press/Seed cake.....	56
4.1.2 Seed Oil.....	58
4.1.3 Examples of Transport using Jatropha Biofuel .....	59
4.1.4 Conclusion of Objective 1: Identification and Evaluation of potential activities that reduce GHG through the use of jatropha biofuel and sub-products .....	60
<b>4.2 To Evaluate the Option of Jatropha Planting as Part of an Afforestation (A) or Reforestation (R) Project under CDM .....</b>	<b>61</b>
4.2.1 Risk of Reversibility: .....	66
4.2.2 Commercialization of Carbon Sink Credits .....	67
4.2.3 Conclusion of Objective 2: Option of Jatropha planting as a part of an Afforestation/Reforestation project under CDM.....	68
<b>4.3 To Identify those Conditions that Make a CDM Project Suitable for Developed and Developing Countries.....</b>	<b>69</b>
4.3.1 Additionality: .....	70
4.3.1.1 Current Laws, Policy and Regulations .....	71
4.3.1.2 Barrier analysis .....	71
4.3.1.3 Common practice analysis.....	79
4.3.2 Sustainability of the Project.....	80
4.3.3 Ownership of Claimed Emission Reductions.....	83
4.3.4 Monitoring .....	85
4.3.5 Detractors of Biofuel Plantations.....	86
4.3.5.1 Ecosystem Destruction .....	86
4.3.5.2 Fertilizer, Water and Soil Requirements .....	87
4.3.5.3 Threat to Food Supplies.....	88
4.3.5.4 Land use.....	88
4.3.5.5 Conclusion of Detractors of Biofuel Plantations.....	89
4.3.6 Detractors of CDM projects.....	89
4.3.6.1 Greenwashing .....	90
4.3.6.2 Conclusion of Detractors of CDM projects. ....	91

<b>CHAPTER 5 .....</b>	<b>92</b>
<b>5 RESULTS AND DISCUSSION FOR QUANTITATIVE FINDINGS.....</b>	<b>92</b>
<b>5.1 CO<sub>2</sub> Captured for Jatropha forest.....</b>	<b>92</b>
<b>5.2 Estimation of the Amount of Reduction Emissions or Certified Emission Reduction (CERs).....</b>	<b>97</b>
5.2.1 Estimate of Jatropha’s Biofuel Production.....	98
5.2.2 Estimation of the Baseline Emissions .....	101
5.2.3 Jatropha’s Biodiesel Process Emissions .....	105
5.2.3.1 Planting and Crop Management.....	107
5.2.3.2 Processing the Feedstock into Biofuel .....	116
5.2.3.3 Transporting the Feedstock and the Final Fuel .....	119
5.2.3.4 Other Emissions.....	123
5.2.3.5 Total Emissions from the Project Activity.....	124
5.2.4 Estimation of Emission Reductions.....	130
5.2.5 Estimation of Carbon Credit Profit.....	133
5.2.6 Summary .....	137
<b>6 CONCLUSIONS AND IMPLICATIONS.....</b>	<b>138</b>
<b>APPENDICE.....</b>	<b>142</b>
<b>REFERENCES.....</b>	<b>153</b>

## LIST OF TABLES

Table 2.1: Classification of priorities for an Afforestation/Reforestation CDM project	33
Table 2.2: Biodiesel Plants in Operation in Malaysia	38
Table 2.3: Total carbon uptake increments of different plantation forests according to species	40
Table 2.4: LULUCF potentials of considered Non-Annex B countries – first commitment period (in tCO <sub>2</sub> )	40
Table 4.1: Features of Jatropha	62
Table 4.2: Prices of Diesel in Chile, Malaysia and New Zealand (US\$/ m <sup>3</sup> )	73
Table 5.1 : Carbon stock per hectare for Douglas-fir, exotic softwoods, exotic hardwoods and indigenous forest (expressed as tonnes of carbon dioxide per hectare)	93
Table 5.2: Carbon stock per year CO <sub>2</sub> (Tonnes)	95
Table 5.3: Management of Jatropha	98
Table 5.4: Jatropha oil expected to be produced/year	99
Table 5.5: Baseline Emissions Scenario 1 (conservative scenario)	103
Table 5.6: Baseline Emissions Scenario 2 (optimistic scenario)	104
Table 5.7: GHG sources in well-to-wheel analysis	105
Table 5.8: Project emissions for fossil fuel consumption (Scenario 1)	110
Table 5.9: GHG Project Emissions for Fossil Fuel Consumption (Scenario 2)	111
Table 5.10: Projected emissions resulting from the application of nitrogen fertilizer	114
Table 5.11: Project emissions related to fossil carbon content of methanol input to biodiesel production (Scenario 1)	118
Table 5.12: Project emissions related to fossil carbon content of methanol input to biodiesel production each year (Scenario 2)	119
Table 5.13: Project emissions resulting from transportation (fuel consumption) Scenario 1	122
Table 5.14: Project emissions resulting from transportation (fuel consumption) Scenario 2	123
Table 5.15: Project Activity Emissions (Scenario 1)	125
Table 5.16: Project Activity Emissions (Scenario 2)	127
Table 5.17: Emissions Reduction- Scenario 1 (CO <sub>2</sub> -e)	130
Table 5.18: Emissions Reduction- Scenario 2 (CO <sub>2</sub> -e)	131

Table 5.19: Profit from the selling of CERs (Scenario 1) .....	134
Table 5.20: Profit from the selling of CERs (Scenario 2) .....	135
Table 5.21: Results Summary.....	137

## LIST OF FIGURES

Figure 2.1: Carbon dioxide emission, life cycle analysis .....	10
Figure 2.2: Jatropha seeds .....	11
Figure 2.3: Clean Development Mechanism .....	17
Figure 2.4: Overview of the CDM project cycle. ....	18
Figure 3.1: Relationship between Chile, Malaysia and New Zealand in the CDM. ....	52
Figure 4.1: Different uses of Jatropha .....	54
Figure 4.2: By products unit process .....	56
Figure 4.3: Prices of Diesel in Chile, Malaysia and New Zealand (US\$/ m <sup>3</sup> ) .....	75
Figure 4.4: Factors that affect biodiesel development in Chilean and Malaysian markets. ....	76
Figure 5.1: Jatropha oil (tonnes/year/hectare) .....	100
Figure 5.2: Life Cycle of Biofuel Production.....	106
Figure 5.3: Project emissions related to consumption of fossil fuel (tonnes CO <sub>2</sub> ).....	112
Figure 5.4: Projected emissions resulting from the application of nitrogen fertilizer..	114
Figure 5.5: Project emissions related to fossil carbon content of methanol input to biodiesel production .....	117
Figure 5.6: Project emissions resulting from transportation (fuel consumption).....	121
Figure 5.7: Classification of project activity emissions during the period studied (Scenario 1) .....	126
Figure 5.8: Classification of project activity emissions during the period studied (Scenario 2) .....	128
Figure 5.9: Capture and emissions of CO <sub>2</sub> of jatropha. ....	129
Figure 5.10: Comparison between the emission reductions in both scenarios.....	132
Figure 5.11: Profit from the selling of CERs. Both Scenarios. ....	136

## LIST OF EQUATIONS

Equation 1	.....	94
Equation 2	.....	101
Equation 3	.....	108
Equation 4	.....	113
Equation 5	.....	117
Equation 6	.....	124

## LIST OF ABBREVIATIONS

A/R	: Afforestation/ Reforestation
B1, B2...B99	: Blended biofuel with diesel in percentage of 1, 2...99.
CDM	: Clean Development Mechanism
CERs	: Certified Emission Reductions
COP	: Conference of Parties
DNA	: Designated National Authority
DOE	: Designated Operational Entity
EU	: Europe Union
ETS	: Emission Trading Scheme
FRIM	: Forest Research Institute Malaysia
GHG	: Green House Gases
IDI	: Indirect Injection
LULUCF	: Land-Use, Land-Use Change and Forestry
LCA	: Life Cycle Assessment
NEECS	: National Energy Efficiency and Conservation Strategy
NZ	: New Zealand
NZTS	: New Zealand Transport Strategy
OECD	: Organization for Economic Cooperation and Development
PIN	: Project Idea Note
POME	: Palm Oil Mill Effluent
PPO	: Pure Plant Oil
RM	: Ringgits (Malaysia)
UNFCC	: United Nations Framework on Climate Change