The Implementation and Achievement of Biofuel Sustainability Principles in Sub-Saharan Africa: recognising limitations and opportunities

This dissertation is presented for the degree of Doctor of Philosophy

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Abstract

Generating a global effort to source alternate energy sources in response to concerns for energy security and rising oil prices has sparked a growing demand for biofuels. This increasing interest has raised questions regarding their sustainable production, especially in sub-Saharan Africa.

Biofuels – potential carbon-neutral renewable hydro-carbon energy – are regarded as a likely mechanism for diversifying agriculture, alternate energy sources, security of energy supply, job creation and the reversal of land degradation. Possible adverse environmental and socio-economic implications, especially in relation to the “food and fuel” debate and land competition, feature in contemporary social discourse. Current concerns include how economic benefits are distributed, socio-economic impacts of large scale development, and improved land use planning directed towards biofuel integration.

This research began in pursuit of a comprehensive sustainability assessment framework for biofuel production in developing countries. Within the year (2010) a flood of initiatives arrived on the international stage, suggesting many international institutions with an interest in biofuels had investigated similar concerns. However, the implementation and achievement of these sustainability initiatives in developing countries remains problematic. Mechanisms ranging from voluntary standards to regulatory certifications have been implemented to address sustainability issues, including social, environment and economic measures. Often the design of an assessment framework does not consider the diverse stakeholder understandings or their capacity for the implementation of such initiatives. Tools such as environmental impact assessments, life-cycle assessment and social impact assessment may be useful, however, at a local level their implementation is rife with complexities. This is a concern considering that key to achieving the aims of assessment frameworks are the successful implementation of sustainability principles.

This research aims to recognise opportunities and limitations to the successful implementation and achievement of biofuel development sustainability principles in sub-Saharan Africa, and to help understand solutions to limitations. Through a systematic process of examining theory, case study research and an expert-oriented survey, the aim is to better understand solutions to limitations and uncover approaches towards successful implementation of sustainability principles in sub-Saharan Africa. The following five objectives are proposed to help achieve the overarching aim: identify theoretical discourse exhibiting an interest in both sustainability and development in sub-Saharan Africa; explore approaches towards the implementation of sustainable biofuel development in sub-Saharan Africa; examine the relationships of biofuel developments and their effects on socio-
economic and environmental sustainability; ascertain local and national implementation opportunities and constraints of sustainable biofuel cultivation; and discuss limitations and opportunities for biofuel development to achieve sustainability.

Drawing on the key interests of several supporting theories, a conceptual framework from which to develop an understanding of widespread biofuel sustainability quandaries in sub-Saharan Africa is presented. The results of a survey comprising thirty-eight international experts suggest that projects that display a high degree of transparency, dynamic stakeholder participation and include local villagers as partners are most likely to achieve sustainability principles. Assisted by an advisory/mediating body, a process that attempts to harmonise sustainability principles and integrate the different interests of diverse stakeholders is presented.

Building on the results of the survey, a cross-sectional study was designed by way of case study research on two projects in each of two countries in sub-Saharan Africa. The countries, Zambia and Zimbabwe, were chosen for their characterisation of many sub-Saharan developing countries – high rates of poverty, soil erosion, deforestation, unemployment, inequitable distribution of resources, reliable energy deficiency, poor governance and health issues. Semi-structured interviews conducted with stakeholders involving two biofuel case study projects in Zambia ascertained the likely barriers and opportunities for biofuel production linked to *Jatropha curcas*.

The results suggest that imbalances in the allocation of political and social influence, knowledge and access to resources provide a likely rationale for the lack of sustainability in biofuel developments in emerging countries. Through semi-structured and open-ended interviews and physical observation in relation to a large-scale biofuel case study in Zimbabwe, it is argued that biofuel initiatives can uphold societal and environmental integrity if the capacity of locals is developed to understand equitable cost and benefit sharing within effective sustainability implementation guidelines. This research advances the implementation and achievement of biofuel sustainability principles and has application not only to Zambia and Zimbabwe, but to other developing countries in sub-Saharan Africa and beyond.
Declaration

This thesis is submitted to Bond University in fulfilment of the requirements of the degree of Doctor of Philosophy. This thesis represents my own original work towards this research degree and contains no material which has been previously submitted for a degree or diploma at this University or any other institution; except where due acknowledgement is made.

In addition I certify that all information sources and literature used are specified in the thesis.

Ian Duvenage
Table of Contents

Abstract ............................................................................................................................................... I
List of Figures ...................................................................................................................................... VIII
List of Tables ...................................................................................................................................... VIII
Acknowledgements ........................................................................................................................ XI
Chapter 1 Introduction ...................................................................................................................... 1
  1.1 Overview ..................................................................................................................................... 1
  1.2 Rationale for the Thesis ............................................................................................................. 4
  1.3 Significance of the Research .................................................................................................... 6
  1.4 Aim and Objectives .................................................................................................................. 7
  1.5 Scope of the Research .............................................................................................................. 10
  1.6 Research Methods .................................................................................................................... 12
  1.7 Limitations of the Research .................................................................................................... 123
  1.8 Thesis Structure ......................................................................................................................... 15

Chapter 2 Understanding sustainable biofuel development: a sub-Saharan Africa perspective ........................................................... 18
  2.1 Introduction ................................................................................................................................ 19
  2.1.1 Sustainability, Policy and Principles .................................................................................. 20
  2.2 Biofuel Sustainability Concerns ............................................................................................... 23
  2.3 Sustainability Issues/Aspects .................................................................................................... 24
  2.4 Supporting Theories .................................................................................................................. 25
  2.4.1 Political Ecology .................................................................................................................. 27
  2.4.2 Development Economics ..................................................................................................... 29
  2.4.3 Social Capital ........................................................................................................................ 31
  2.4.4 Institutional Economics ......................................................................................................... 33
  2.4.5 Relationships with Sustainability Aspects/issues ................................................................ 35
  2.5 Discussion .................................................................................................................................. 35
4.6 Conclusion and recommendations ................................................................. 104

Chapter 5 Grappling with biofuels in Zimbabwe: depriving or sustaining societal and environmental integrity? ................................................................. 111

5.1 Introduction ........................................................................................................... 112
5.1.2 Political Ecology of Biofuels ........................................................................... 115
5.2 Zimbabwe .................................................................................................................. 115
5.2.1 Agro ecological Regions ............................................................................... 116
5.2.2 Green Fuel Case Study Background .......................................................... 117
5.3 Methods .................................................................................................................... 118
5.3.1 Interviews with Investor Representatives .................................................. 119
5.3.2 Local Inhabitant Interviews: Green Fuel .................................................... 120
5.4 Results ....................................................................................................................... 121
5.4.1 Local Livelihoods and Agro-production .................................................... 123
5.4.2 Livelihood Concerns ....................................................................................... 123
5.4.3 Social Policies ................................................................................................. 125
5.4.4 Agro-Livelihood Accessions ........................................................................ 126
5.4.5 Gender Equality ............................................................................................... 127
5.4.6 Agro-production Environmental Policies ................................................. 128
5.4.7 Environment ...................................................................................................... 128
5.5 Discussion ............................................................................................................... 129
5.6 Conclusions ............................................................................................................ 132
5.7 Recommendations ................................................................................................. 133

Chapter 6 Sustainability implementation barriers for biofuel development in sub-Saharan Africa: moving from challenge to opportunity ................................................. 140
6.1 Introduction ............................................................................................................. 141
6.2 Methods ................................................................................................................... 144
6.3 Sustainability Limitations for Biofuel Implementation ...................................... 145
6.4 Supporting (Informing) Theories ...................................................................... 150
6.5 Examples of Analysing Initiatives .................................................................................... 154
6.5.1 Sustainability Principles, Criteria and Indicators ............................................................. 154
6.5.2 Convention on International Trade in Endangered Species (CITES). ................................. 157
6.5.3 Bottom-up Design, Top-down Implementation..................................................................... 159
6.5.4 Intermediaries.................................................................................................................. 160
6.5.5 Q Methodology............................................................................................................... 162
6.5.6 Sindex............................................................................................................................. 163
6.5.7 Post-Occupancy Evaluation (POE). ................................................................................... 163
6.5.8 Enterprise Initiatives ......................................................................................................... 166
6.5.9 E-technology .................................................................................................................... 167
6.5.10 Stakeholder Analysis ....................................................................................................... 168
6.6 Proposed CITB Framework.................................................................................................... 169
6.7 Recommendations and Conclusions ................................................................................... 172

Chapter 7 Conclusion ............................................................................................................. 182
7.1 Research Findings .............................................................................................................. 182
7.2 Discussion.......................................................................................................................... 188
7.3 Contribution to Knowledge ............................................................................................... 193
7.4 Implications for Practice .................................................................................................... 196
7.5 Directions for Further Research ......................................................................................... 197
7.6 Final Reflection ................................................................................................................. 199

Consolidated References ...................................................................................................... 201
Appendix A Expert Survey Questions and Responses................................................................. 225
Appendix B Local Small-Holder Questions and Interview Responses: Zambia......................... 252
Appendix C Local Small-Holder Questions and Interview Responses: Zimbabwe...................... 293
Appendix D Acceptance Letter and Final Proof Amendments: Paper 1
(Chapter 2), African Journal of Economic and Sustainable Development .......................... 329
Appendix E  Reviewer Comments and Responses: Paper 2 (Chapter 3),
Journal of Environment, Development and Sustainability.................................330

Appendix F  Reviewer Comments and Responses: Paper 3 (Chapter 4),
Natural Resources Forum ....................................................................................341

Appendix G  Reviewer Comments and Responses: Paper 4 (Chapter 5),
Journal of Cleaner Production ............................................................................352

Appendix H  Zimbabwe and Zambia Interview Transcriptions .............................362
List of Figures

Figure 2.1 Process for developing a conceptual framework to inform biofuel implementation ................................................................. 22
Figure 2.2 Towards a conceptual framework for sustainable biofuel development .............. 38
Figure 3.1 Percentages of surveyed experts' responses to the biofuel development project type seen as most likely to achieve sustainability .......... 61
Figure 3.2 Surveyed expert responses and related percentages to given rankings (1-4) for the governance of biofuel project sustainability .......... 62
Figure 3.3 Average Criteria Governance Scores .......................................................... 63
Figure 3.4 Surveyed expert responses and related percentages to given rankings (to 4) for biofuel project best practice ............................................. 64
Figure 3.5 Average criteria best practice scores .......................................................... 65
Figure 3.6 Deficiencies affecting biofuel project sustainability ...................................... 65
Figure 4.1 Localities of bioenergy cases: A-D1 Oils; Eastern Zambia, B-Southern Biopower; Southern Zambia ................................................................. 90
Figure 5.1 Natural ecology (farming) regions of Zimbabwe and case study areas:
   A - Green Fuel. Chisumbanje; B - Green Fuel, Middle Save ................................ 117
Figure 5.2 Key livelihood concerns of local small-scale famers .................................. 124
Figure 6.1 Aims and methodological process for this research ....................................... 145
Figure 6.2 Towards a biofuel development conceptual framework .................................. 150
Figure 6.3 Strategy towards the integration of diverse stakeholder perspectives .......... 161
Figure 6.4 Key methodological procedures required for stakeholder analysis .............. 169
Figure 6.5 Conceptual sustainability framework: Towards understanding solutions to sustainability limitations ................................................. 170
List of Tables

Table 1.1 Thesis structure ........................................................................................................ 17
Table 2.1 Biofuel assessment initiatives .................................................................................... 24
Table 2.2 Sustainability aspects/issues addressed by five initiatives reviewed ....................... 26
Table 2.3 Political ecology: Linking sustainability to biofuel implementation in sub-Saharan Africa ........................................................................................................................................................................ 29
Table 2.4 Development economics: Linking sustainability to biofuel implementation in sub-Saharan Africa ........................................................................................................................................................................ 31
Table 2.5 Social capital: Linking sustainability to biofuel implementation in sub-Saharan Africa ........................................................................................................................................................................ 32
Table 2.6 Institutional economics: Linking sustainability to biofuel implementation in sub-Saharan Africa ........................................................................................................................................................................ 32
Table 2.7 Supporting theoretical influences on biofuel sustainability aspects/issues ........................................................................................................................................................................ 36
Table 3.1 Sustainable biofuel development challenges ............................................................. 67
Table 3.2 Representation, communication and integration of diverse stakeholder opinions ........................................................................................................................................................................ 68
Table 3.3 Strategy towards the integration of diverse stakeholder perspectives ..................... 72
Table 4.1 Biofuel assessment frameworks (initiatives) ............................................................... 81
Table 4.2 Basis of Zambian bioenergy policies introduced in 2007, including biofuel and woodfuel policies ........................................................................................................................................................................ 87
Table 4.3 General aspects of the researched case studies in Zambia ...................................... 89
Table 4.4 Sustainability society criteria and evaluation scores, and evaluation indicators ........................................................................................................................................................................ 93
Table 4.5 Environmental sustainability criteria and evaluation scores and environmental sustainability indicators ........................................................................................................................................................................ 94
Table 4.6 Sustainability economic criteria and evaluation scores, and economic sustainability indicators ........................................................................................................................................................................ 95
Table 5.1 Sustainability criteria derived through the integration of sustainability initiatives ..........118

Table 5.2 Examples of interview questions to both local inhabitants and investor representatives to understand the effects on criteria presented in Table 5.1 ..........119

Table 6.1 Limitations and the challenges to sustainability achievement .........................156

Table 6.2 Sustainability aspects/issues addressed by four initiatives reviewed ...............156

Table 6.3 Distinguishing between the CITES framework and modifications for biofuel development (drawing on political ecology perspectives) .........................157

Table 6.4 Core principles underpinning CITES policies (adapted for biofuel development) ..................................................................................................................158

Table 6.5 Facilitation aims of CITES for member parties displayed alongside modifications for biofuel development ........................................................................158

Table 6.6 The potential biofuel sustainability benefits by drawing on the CITES policy framework reviewal process ..................................................................................159

Table 6.7 General processes for quality evaluation approaches ......................................165
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