

## **Final Progress Report**

Sustainability Science Program

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**Expected graduation date:** May 2010

**Faculty host:** Professor Henry Lee Jassim M. Jaidah Family Director Environment and Natural Resources Program, Harvard Kennedy School.

**Project:** Socioeconomic sustainability of biofuel production in Sub-Saharan Africa: Evidence from a Jatropha outgrower model in rural Tanzania

**Abstract:** As developing countries explore the possibility of building up (or expanding) a biofuel production industry, they are confronted with two classes of production models: large plantation models with the product earmarked for export, and community or small landowner-based models (outgrower). The argument for the latter is that it provides significantly greater social benefits to the localities and regions. If one of the goals of the development of a biofuel industry is to enhance the quality of life for the local population, the large plantation model fails to meet those goals because it often provides minimal local jobs and does not result in investment in the social infrastructure. On the other hand, emphasizing social investment can result in less efficient production, and products may not be able to compete on the international market. In recent months, some people have argued that the outgrower model, which has been adopted in parts of Africa may actual be a workable model (FAO 2009). For this reason, I have analyzed the case study of the outgrower model adopted by Diligent Tanzania. This allows me to assess the economic, social and political benefits and costs of the outgrower scheme. Diligent is a company active in the promotion, production and usage of Jatropha oil and they produce biodiesel for transportation fuel. In Tanzania they have activities in 5 regions, covering 5000 farmers.

The case study provides actual data to analyze the social impact of biofuel production on small holder farmers’ households, balancing the perspectives of the main stakeholders involved. Therefore, I collected data on farmers’ standard of living (Data include impact on food security, impact on property values, the development of local infrastructure, the development of local credit markets, impact on labor and wages, increased knowledge in agricultural techniques, gender issues and impact on land and water supplies), on the Company business strategy (overall impact and strategy) and on the policies implemented in the Country. The aim is to build the evaluation framework to assess the sustainability of the model combining the three perspectives listed above. I investigated different criteria reviewing the literature on sustainability assessment and certification. Then, I constructed some indicators that

can give a real measure of the impact that biofuel production may have at a local level in a Sub-Saharan African country measuring the changes in the standard of living of stakeholders who are connected to the production (local population, workers, farm management, supplier, local government, final users etc) and in terms of environmental impact and rural livelihoods, especially on the issue of food security. Following the survey, it has been possible to create a map of action or guidelines for a sustainable and responsible biofuel production and then some policy recommendation could be detected for a more generalized evaluation framework starting from a local level analysis. Within Sub-Saharan Africa there is a lack of policies to support small-scale biofuel development at the local level, including fiscal and financial incentives. Policies are needed to ensure biofuel development “by local people for local people” in a sustainable manner. In this perspective the research project identifies a guideline for rewarding sustainable practice for biofuel feedstock production that promotes social well being at the local level, so that this model can be exported to a larger dimension. Moreover, I have analyzed data and I will define and apply the socio economic sustainability framework assessment to the Jatropha production scheme in Tanzania. Quantitative and qualitative analyses were conducted based on objective data and surveyed subjective perceptions. I have also explored the biofuel industry in Zambia in order to compare it to the Tanzanian model, in particular at the policy level. I would like also to enlarge my research exploring a case study in Zambia from the investor’s perspectives and partially applying the framework assessment to it.

**Keywords:** Sustainable Development, Biofuel, social indicators, sustainability criteria.

### **Identification of the problem**

Investments in Biofuel have the potential to transform economies, landscape and standard of living in Developing Countries. Many firms are currently looking for opportunities to invest in the biofuel productions sector in Tanzania and in many African Countries. In Sub-Saharan Africa and in particular in Tanzania, Jatropha is considered to be one of the most promising candidates for biodiesel feedstock mostly due to its adaptability to semi-arid lands and because it is a non food crop. There is therefore an urgent need to examine the viability of outgrower Jatropha production and value chain, focusing on the economic incentives and socio economic impact on small holder farmers who engage in the production. It is important to discuss the potential for Jatropha to contribute to the improvement of local livelihood.

The evaluation of the socioeconomic impact of an outgrower scheme for the production of Jatropha Curcas will have the primary objective of highlighting the social costs and benefits of this particular model of production.

### **Key questions:**

- What is the socioeconomic impact of biofuel production investments on local population?
- Does a sustainable model in biofuel production exist?
- Which are the criteria in order to define “sustainable” a production scheme?



Designing questionnaire			■	■								
Pretesting questionnaire				■	■							
Administering questionnaire					■	■						
Data entry						■	■	■				
Data analysis								■	■	■		
Report writing										■	■	■

**Principle literature:** Household survey methodology, case study methodology, bioenergy production, outgrower scheme, energy policy, energy market, agriculture for development, food security, sustainable agriculture, Tanzania policy paper (poverty reduction strategy), social assessment, development economics, business scheme.

**Empirical data acquisition:** General data from census and Household Surveys (last 2007), Tanzania Bureau of Statistics and EDI/ World Bank.

Data collection: quantitative and qualitative data based on objective evidence and subjective perspective about the indicators selected. The project includes a collection of original data with a questionnaire. Original database collection, in particular from:

- Company: overall impact and strategy considering change in land use and price of commodities  
→ Key person open interview (Diligent General Manager, field officer, etc.)
- Head of village: infrastructure, access to resources, competition with food, property rights  
→ Village representatives interview (Chairman, Sacco's presidents, etc.)
- Farmers: involvement into the production chain and the impact on their income, health status, social networking  
→ Farmers interview: Household level (Questionnaire)  
→ 49 households of farmers in Engaruka Juu (out of 600 hh—around 8% hh out of the total)  
→ 50 household of farmers in Babati District (Villages: Endaberg, Mamire, Riroda, Mwikantsi) (Tot 2400 hh – around 2%)
- Relevant Stakeholder  
→ Key stakeholder interview (Other companies Management, Ministry officer, International organization Directors, etc.)

See methodology section for further details

**Geographical region:**

United Republic of Tanzania, in particular:

- Monduli District in Arusha Region,
  - Location: a rural masai ward situated 100km from Arusha. altitude of 982 meters
  - Total Population: 185,237 district include 20 ward. Engaruka ward is divided in Engaruka Juu and Engaruka Chini and population is 7,295.
  - Main Occupation: pastoralist and agriculture
  - Average Rainfall: 540mm/yr
  - Jatropha: introduced around 20 years ago and was originally used to mark graves and as medicine. around 36 household in the village has a outgrower contract (not clear from the records)
  - Agriculture: characterized by a very short growing period. very poor soil (maize, beans, cassava, onions)
  
- Babati district in Manyara region
  - Location: 3 hours drive from Arusha in Manyara region. altitude of between 900-2,000 meters above sea level
  - Total population: 303,013 include 21 ward and 81 villages. Mamire and Riroda ward have 12,146 population
  - Main Occupation: agriculture
  - Average Rainfall: 800mm/yr
  - Jatropha: introduced in 2007 and many plants are less than 1 year old. over 200 farmers have an outgrower contract in the area and the expectation is 3000 contract at the end of 2009.
  - Agriculture: well drained soil (maize, pigeon pea, sorghum, sunflower, cassava)

Extension to **Zambia**: Kabwe and Central Province

**Final products:**

- May 2010: Doctoral dissertation
  
- September 2009: Possible CID Working Paper

**Other activities over the past academic year:**

Projects

- European Union project on Competence Platform on Energy Crop and Agroforestry Systems for Arid and Semi-arid Ecosystems- Africa (COMPETE) This project focuses on social-economics sustainable development and mechanisms for rewarding best practices for bioenergy systems. <http://www.compete-bioafrica.net/index.html>

- PAT Project at Trento University, Italy. This project analyses the effect of corporate social responsibility on social capital by carrying out an empirical study on a specific kind of nonprofit organizations: the social cooperatives.

### Conferences

- Acting in Time on Energy Policy” conference, Harvard Kennedy School 18-19 September 2008., Cambridge MA
- 15<sup>th</sup> annual International Development Conference, Harvard Kennedy School, 3-4 April 2009, Cambridge MA
- COMPETE International Conference - ‘Bioenergy Policy Implementation in Africa’ 26-28 May 2009 - Lusaka, Zambia
- Harvard Biofuels Workshop, Harvard Kennedy School, 11-12 May 2009 Cambridge, MA

### Publication:

**Giacomo Degli Antoni - Elisa Portale** (2009), Organizzazioni del terzo settore e creazione di capitale sociale: il caso delle cooperative sociali e il ruolo della responsabilità sociale d'impresa, Rivista di Politica Economica, forthcoming. <http://www.rivistapoliticaeconomica.it/saggi.php>

### **Abstract in English**

#### **The third sector organizations and social capital: social enterprises and corporate social responsibility role**

This paper explores the impact of participation in third sector organizations on the social capital of their members. Regarding the social capital studies, we enlarge the set of social capital indices and introduce the implementation of corporate social responsibility (CSR) good practices as an independent variable. Five social capital indices have been elaborated. They refer to the three main social capital dimensions accepted in literature in terms of: relational networks, generalized trust and relational skills. This paper presents two main findings: *i*) the positive impact of the participation in social enterprises on the social capital of members *ii*) the positive effect of the adoption of CSR good practices on the creation of social capital for the members of social enterprises.

**Keywords:** Social capital, corporate social responsibility, social enterprises  
**JEL Classification:** M14; L31, Z13

#### **Principal collaborators outside Harvard :**

- Giacomo Degli Antoni (EconomEtica, Bicocca University)
- Lorenzo Sacconi (Trento University and EconomEtica Research Center)

→ Francesca Farioli (La Sapienza University of Rome)

**Fellowship experience:** I have found very challenging the multidisciplinary and interaction between approaches that the program was able to generate. From my experience in the fellowship, I recognized the value added of having seminars and feedback from fellows with different background. I would find very useful to have more interactions between Academia and more practical methodology and policy-oriented research (i.e. lectures and workshop). Overall my experience has been positive.