1. SESSION DESCRIPTION

ID: S1d

Title of session:
Bioenergy and ecosystem services: Exploring trade-offs at the energy, food, environment and poverty nexus in Africa

Hosts:

<table>
<thead>
<tr>
<th>Host:</th>
<th>Name</th>
<th>Organisation</th>
<th>E-mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host:</td>
<td>Alexandros Gasparatos</td>
<td>University of Tokyo</td>
<td><a href="mailto:gasparatos@ir3s.u-tokyo.ac.jp">gasparatos@ir3s.u-tokyo.ac.jp</a></td>
</tr>
<tr>
<td>Host:</td>
<td>Harriet Smith</td>
<td>University of Edinburgh</td>
<td><a href="mailto:Hes2g08@soton.ac.uk">Hes2g08@soton.ac.uk</a></td>
</tr>
<tr>
<td>Co-host:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Co-host:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others involved:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abstract:

Bioenergy systems are at the confluence of multiple Sustainable Development Goals (SDGs) such as SDG 1 (No Poverty), 2 (Zero Hunger), 7 (Affordable and Clean Energy), 13 (Climate Action) and 15 (Life on Land). The versatility of using biomass across all energy carriers (liquid/gas/solid/electricity/heat) and in diverse technology platforms (e.g. biogas, liquid biofuels, wood pellets) and end-uses (e.g. power generation, transport, cooking) has contributed to the rapid expansion of government policies/mandates and private sector investment in bioenergy in Africa. Bioenergy systems that offer renewable energy and climate benefits with low impacts on ecosystems, can catalyse the transition to a sustainable society and a Green Economy. At the same time if managed effectively, bioenergy systems can have ripple effects at the household level. Different bioenergy options can have positive effects on human health, poverty alleviation and environmental sustainability in poor rural and urban settings of Africa. For example, by 2030 the charcoal trade in sub-Saharan Africa is expected to provide an income for an estimated 12 million people.

However, bioenergy systems are also drivers of ecosystem change, leading to significant negative trade-offs with other ecosystem services. For example the charcoal sector is currently stigmatised as a major agent of environmental degradation and energy insecurity among low-income households. Biofuels have long been blamed for inciting land-grabbing and food insecurity in rural parts of Africa.

So, how can these different aspects be reconciled? Given the large variety of bioenergy production practices, end-uses and socioeconomic contexts, there are still significant research gaps, especially in Africa. The aim of this session is to progress the debate about the potential of the ecosystem services approach to understand trade-offs (whether positive or negative) at the nexus of bioenergy, food security, environment and poverty in Africa.
Voluntary contributions accepted: YES

2. SESSION PROGRAM

Date of session: Tuesday, November 22, 2016

Time of session: 13:30–16:30

Timetable speakers

<table>
<thead>
<tr>
<th>Time</th>
<th>First name</th>
<th>Name</th>
<th>Organization</th>
<th>Title of presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 minutes</td>
<td>Smith</td>
<td>Smith and Gasparatos</td>
<td>University of Edinburgh &amp; University of Tokyo</td>
<td>Opening presentation</td>
</tr>
<tr>
<td>12–15 minutes</td>
<td>Dr. Mansour</td>
<td>Mahamane</td>
<td>Universidade Eduardo Mondlane</td>
<td>Understanding land use/land cover and ecosystem service change using Bayesian Networks and Geographic Information Systems—Example of Mabalane district–Mozambique</td>
</tr>
<tr>
<td>12–15 minutes</td>
<td>Harriet</td>
<td>Smith</td>
<td>University of Edinburgh</td>
<td>Livelihood diversification: the role of charcoal production in southern Malawi</td>
</tr>
<tr>
<td>12–15 minutes</td>
<td>Alexandros</td>
<td>Gasparatos</td>
<td>University of Tokyo</td>
<td>Local food security outcomes of biofuel production in Sub-Saharan Africa: insights from operational projects in Malawi, Mozambique and Swaziland</td>
</tr>
<tr>
<td>12–15 minutes</td>
<td>Anne</td>
<td>Nyambane</td>
<td>Stockholm Environment Institute</td>
<td>Eliminating it versus transforming it</td>
</tr>
<tr>
<td>12–15 minutes</td>
<td>Francis</td>
<td>Johnson</td>
<td>Stockholm Environment Institute</td>
<td>Policies and Institutions for reconciling ecosystem services provision with biofuels investment in Malawi, Mozambique and Swaziland</td>
</tr>
</tbody>
</table>
3. ABSTRACTS

Note: the abstracts are arranged alphabetically, in order of last name

Type of submission: Invited speaker abstract

S1d Sector-oriented sessions

Local food security outcomes of biofuel production in Sub-Sahara Africa: insights from operational projects in Malawi, Mozambique and Swaziland

First author(s): Alexandros, Gasparatos
Co-author(s): Graham von Maltitz, Francis Johnson, Carla Romeu-Dalmau, Boubacar Bald
Affiliation: University of Tokyo
E-mail: gasparatos.alex@gmail.com

The competition between biofuels and food crops in Africa has fuelled heated academic and policy debates regarding the food security outcomes of biofuel expansion. Several studies have suggested that the eventual food security effects of biofuel expansion can be positive or negative depending on various factors including the type of land converted (and its previous use) and the agricultural practices adopted. At the local scale, it is well accepted that biofuels compete directly and indirectly for land (and other agricultural inputs) with food crops. Superficially local food security should decrease as agricultural land is converted to biofuels, especially in Africa where a large proportion of the rural population is engaged in subsistence agriculture. Yet a number of less obvious mechanisms may lead to improved local food security, e.g. higher household incomes that can improve access to food or better access to agricultural inputs that can boost food crop yields. The presentation will initially conceptualise these mechanisms using the ecosystem services approach. Subsequently it will reflect how some of these mechanisms emerge locally, drawing on empirical evidence from 4 operational biofuel projects in Malawi, Mozambique and Swaziland. These projects represent both the main feedstocks (sugarcane, jatropha) and modes of production (plantations, smallholder/outgrower-based production) in Africa. These results are obtained through the analysis of approximately 1650 surveys with households involved (e.g. plantation workers, outgrowers, smallholders) and not involved (control groups) in biofuel value chains. Our findings suggest significant differences on the food security levels of different groups. In particular groups involved in sugarcane production (both as plantation workers and smallholders) and workers in jatropha plantations manifested significantly higher food security than their control groups. In contrast no significant differences were found between jatropha smallholders and their control group. The presentation will then outline some of the main determinants of these patterns.

Keywords: jatropha, sugarcane, biofuels, food security, Africa
Type of submission: Voluntary contribution

S1d Sector-oriented sessions

Policies and Institutions for reconciling ecosystem services provision with biofuels investment in Malawi, Mozambique and Swaziland

First author(s): Francis X., Johnson

Co-author(s): Anne Nyambane, Davies Luhanga, Alexandros Gasparatos, Graham von Maltitz

Affiliation: Stockholm Environment Institute

E-mail: francis.johnson@sei-international.org

Interest in biofuels in sub-Saharan Africa (SSA) during the past decade to support rural and agricultural development has contributed to expansion of areas under both industrial and smallholder biofuel crops and has increased investment in such crops. The socio-economic and environmental implications of these shifts have been investigated in various countries. More recently the local ecology and associated socio-economic factors have come under greater scrutiny, including the differences between large and small-scale systems. The tangible socio-economic benefits and environmental impacts can be placed under the ecosystem services lens to investigate further the socio-ecological dynamics of those living in or near the projects or crop-growing areas. The long-term development of these crops and economic sectors requires enabling policies and institutions that can guide the relevant markets and actors towards socially equitable and environmentally sustainable pathways. We have analysed the cultivation of jatropha and sugarcane across several locations in Malawi, Mozambique and Swaziland, based on a sampling of households engaged in large and small-scale cultivation and in control areas nearby. A mix of local and national policies and institutions has impacted the development in these areas and we have identified some key issues that arise under the ecosystem service lens. A comparative institutional assessment is thus presented here across the countries and study areas so as to suggest how to better reconcile ecosystem service provision with biofuels investment. The lessons learned here might be usefully applied elsewhere in SSA where some of the same trade-offs arise.

Keywords: policies, institutions, sugarcane, jatropha, ecosystem services
Understanding land use/land cover and ecosystem service change using Bayesian Networks and Geographic Information Systems—Example of Mabalane district—Mozambique

First author(s): Dr. Mansour, Mahamane
Co-author(s): Pedro Zorrila–Miras, Marc Metzger, Almeida Sitoe, Natasha Ribeiro, Genevieve Patenaude
Affiliation: Universidade Eduardo Mondlane
E-mail: msourtchiani77@gmail.com

Wood for charcoal production constitutes a key ecosystem service (ES) in Mozambique. The market for charcoal is estimated at US$400 million a year in Mozambique. The importance of this sector is highlighted by the fact that a further 70% of households in selected villages in study area are involved in charcoal production. Due to the key role the charcoal industry plays in people’s livelihood, availability of suitable wood for charcoal production has decreased considerably because of changes in land use land cover (LULC). This work applied a probabilistic modelling approach combining Bayesian Belief Networks (BBN), Geographic Information Systems (GIS), Remote Sensing data, field data, and expertise from different stakeholders to understand how changes in LULC affect charcoal production and associated changes in woodland–based ecosystem services. Three scenarios were tested using different combinations of interventions such as facilitate access to licensing of communities, improve technical capacity of communities, improve institutional capacities of communities, develop forest management plan, improve forest control and promote non-charcoal income activities in relation to charcoal demand. The three scenarios where: 1) Promotion of large private initiatives: high charcoal demand and current interventions; 2) Promotion of small scale development: low charcoal demand and application of all the interventions and 3) Balanced: combination of both scenarios. A BBN was used to explore the influence of these scenarios from 2014 to 2035 on resulting LULC. This research facilitated stakeholder engagement, and improved the understanding of the interaction between LULC changes and woodland–based ES. The results highlighted the importance and spatial distribution of woodland–based ES to the local communities and that availability of suitable wood for ES will decrease under the first scenario.

Keywords: Bayesian belief networks, geospatial software, land use land cover, ecosystem services
Type of submission: Voluntary contribution

S1d Sector–oriented sessions

**Eliminating it versus transforming it**

*First author(s):* Ms. Anne Nyambane  
*Co–author(s):* Francis X. Johnson, Caroline Ochieng  
*Affiliation:* Stockholm Environment Institute  
E-mail: anne.nyambane@sei–international.org

Charcoal is an important provisioning good and has a great potential of enhancing the livelihoods of the people especially the poor often involved in the charcoal business. Furthermore, it provides an affordable and reliable source of energy for low and medium income households in most urban and peri-urban areas in Sub-Saharan African countries. The current situation in most African countries is that of charcoal being considered informal and illegal. This has led to measures to stop charcoal production and these measures have had negative impacts on other ecosystem services users. Using Malawi as a case study, we highlight the plight of various ecosystem services users whose source of livelihood is threatened by these measures. Furthermore, we use a case study in Kenya, where instead of making charcoal go away, measures in terms of technical, financial and polices are being put in place to transform the charcoal sector into a formal economy and a sustainable business.

*Keywords:* Ecosystem services, livelihoods, charcoal production, sustainability
Livelihood diversification: the role of charcoal production in southern Malawi

First author(s): Harriet, Smith
Co-author(s): Kate Schreckenberg, Malcolm Hudson
Affiliation: University of Edinburgh
E-mail: harriet.smith@ed.ac.uk

Growing urban populations in Sub-Saharan Africa are increasing demand for charcoal. Here, we present a detailed case study of three communities supplying charcoal to Zomba, a small city in Southern Malawi. Using the Sustainable Livelihoods Framework to structure our analysis, we examine the seasonality of charcoal production, how livelihood outcomes vary between men and women, and identify sources of vulnerability for charcoal producer livelihoods. Drawing on data from four focus group exercises in each community and a total of 42 semi-structured interviews, we identify direct (e.g. financial) and indirect (e.g. strengthening of social networks, improved access to goods and services, opportunities for livelihood diversification) benefits that contribute to reducing producers’ vulnerability to financial insecurity and improve their livelihoods. Irrespective of the benefits obtained and the actions (e.g. prioritising charcoal production over farming) of producers, participants did not perceive production as an honoured profession, which is no doubt an outcome of the profession being marginalised and outlawed in Malawi. Under certain conditions women were more dependent on income from charcoal production than men, as they had fewer alternative income generating options available to them. There was no reported management of charcoal resources in the study area, therefore the longevity of any benefits gained from producing charcoal are uncertain. Malawi’s current de facto charcoal ban undermines financial benefits due to enforcement costs and longer-term uncertainty in producers’ livelihood outcomes, and thus is a principal source of financial vulnerability for charcoal-producer livelihoods.

Keywords: Malawi, Forest management, Wellbeing, Livelihoods, Charcoal