Biofuels and Invasives

MANAGING THE INVASIVE RISK OF BIOFUEL PRODUCTION

Workshop Summary

Nairobi, Kenya, 20-22nd April, 2009

Participants from left to right: Sarah Simons, Francis Ogwal, Eva Kassara, Ryan Blanchard, Rezene Fessehaie, Seynou Oumarou, Brian Nkandu, Kirsten Roettcher, Abed Kagundu, Arne Witt, Lovemore Simwanda, Sam Keam, Gadi Gumisiriza, Graham von Maltitz, Nadine McCormick, Geoffrey Howard, Peter Sumbi, Abdulrahman S. Issa

Table of contents

Abbreviations & Acronyms

CABI	Centre for Agriculture and Biosciences International Africa
CBD	Convention on Biological Diversity
COMESA	Common Market for Eastern and Southern Africa
CSIR	Council for Scientific and Industrial Research
ECZ	Environmental Council of Zambia
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GISP	Global Invasive Species Programme
GMOs	Genetically Modified Organisms
HCV	High Conservation Value
ICRAF	International Centre for Research in Agro-Forestry
IPM	Invasive Plant Management
IPPC	International Plant Protection Convention
IS	Invasive Species
IUCN	International Union for Conservation of Nature
KEPHIS	Kenya Plant Health Inspectorate Service
MOU	Memorandum of Understanding
NARO	National Agricultural Research Organsiation
NEMA	National Environment Management Authorities
NEPAD	New Partnership for Africa's Development
NPPO	National Plant Protection Organisation
RSB	Roundtable on Sustainable Biofuels
SA	South Africa
SEA	Strategic Environmental Assessment
WRA	Weed Risk Assessment
WTO	World Trade Organisation
WWF	Worldwide Fund
ZEGA	Zambia Export Growers Association

1 Introduction

This paper summarises the proceedings of the first IUCN Workshop on Biofuels and Invasive Species, held in Nairobi on the 20th-22nd April 2009. The workshop was a first step to including invasive species issues into the wider *Managing Biodiversity Risks of Biofuels* project and focused on avoiding, mitigating and managing the risks of invasion posed by commercial scale biofuel developments in Africa. The workshop convened experts from regional governments, plant protection organisations, research institutions, NGOs and the private sector to identify risks along the biofuel production and supply chain and weaknesses with current regulations. The workshop was used to develop a framework for guidelines for the prevention and management of invasion related to biofuels developments. It is hoped that the guidelines will be adopted by the Roundtable on Sustainable Biofuels (RSB) and others in the future.

2 Overall context of biofuel development

During the workshop, participants were encouraged to focus on the direct linkages between biofuels and invasive species. Nevertheless, it was acknowledged that invasive risks must be considered within the broader context of biofuel development and investments. Rather than focusing on these discussions, such issues were "parked" during the workshop and will be referred to during the development of the guidance document. They were grouped as follows:

Biofuel strategies - general

- Land tenure issues can influence the sustainability of a project (whether title deeds, customary land tenure, avoidance of conservation areas, etc.)
- The long-term viability of biofuel markets should be questioned. We need to learn lessons from the collapsed markets of sisal, cotton, vanilla, etc. – where abandoned plantations led to the invasion of such cash crops into surrounding ecosystems.
- Should there be equivalent standards for European and African markets? This may depend on who are we producing for: whether national or European markets? However, a number of African countries have sustainability requirements contained within their National Biofuel Strategies (e.g. Tanzania).
- The assumption that biofuel investments will automatically lead to rural development needs to be questioned. For example, will communities actually accept new technologies? Will they have adequate resources?
- Although small-scale biofuel developments for subsistence/access to energy do carry invasive risks, the approach is different to that of commodity/cash crop level development. Efforts should be focused on the large-scale developments in the first stage where the need is most urgent, related to large-scale proposed developments in the region that are not always subjected to sufficient strategic and environmental assessments.

Invasives - general

- Lots of systems are not in place e.g. Risk Assessment skills, which presents a problem for regulators.
- There are many misconceptions around invasiveness. Some key clarifying facts are:
    - It is not a species *per se* that is invasive, but the vector (such as birds, flooding) that make it invasive.
    - Utilization *alone* (such as for biofuel feedstock) can control invasive species.
    - A *native* species does not refer to a country, but rather an ecosystem. Therefore species that are currently present may become invasive gradually or suddenly with changes in the ecosystem. Climate change will heighten this risk.
- Agro-economic aspects are a priority for biofuel decision-makers, and so we need to communicate better this aspect of invasion. We need to learn lessons from past experiences. For example, the message that invasives cost 5% of global GDP has not been effective, and other examples like the invasion by water hyacinth has also failed to stimulate interest in biological invasion among decision makers.
- Genetically modified organisms (GMOs) were mentioned occasionally during the workshop, including as a mechanism of introducing novel plants into an ecosystem, and therefore it was questioned whether the invasive guidelines could be applicable to GMOs as well. However,

participants were cautioned not to include GMOs since they were subject to different rules and required a different (though similar) approach, based on the Cartagena Biosafety Protocol and linked to international trade.

Biofuels and invasives

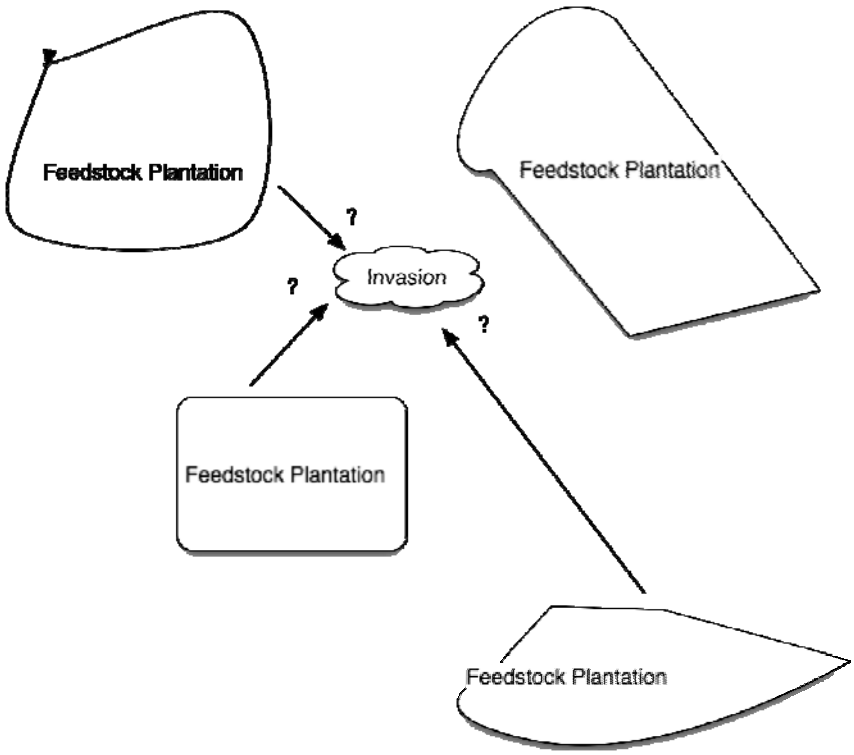
- Given their common characteristics, there are perverse incentives in place for biofuel developments that favour species with invasive tendencies such as fast growth, high seed production, survives adverse conditions e.t.c..
- The private sector actively investing in Africa is aware of extra sustainability demands from European consumers and politicians, and are therefore prepared to undertake more detailed assessments than the minimum required of them by national legislation.
- This brings the question of what is the role of different actors. Whether the National Environment Management Authorities (NEMA, NEMC, ECZ, EPA), proponents of biofuels, government agencies. Ideally, they should all work together to improve impact assessments and capacity-building.

3 Risk factors of biofuel developments and proposed solutions

Participants where encouraged to identify factors that exacerbate the risk of biofuel feedstocks becoming invasive, as well as to propose solutions to address the risks. These then formed some of the proposed outputs.

Risk factor	Proposed solution
Import agencies don't know what different types of plants are being imported as biofuel feedstocks	Taxonomic support and capacity for recognition – for individual high-risk species
Invasive species are not always incorporated into EIAs and related assessment processes	- capacity building for EIA practitioners and review committees - include invasive species considerations in EIA frameworks with guidelines
EIAs are too expensive and hard for small farmers	Strategic environment assessments should be carried out (but who should pay for the assessment as well as implementation of its recommendations? Presently it is "governments") – lobby for funds from.
Parallel processes of introduction approval allow potential invasive species to enter an ecosystem/country	- Need cross-communication between relevant government agencies (e.g. KEPHIS)and the EIA process. - Seed/plant certification may also assist.
Absence of good legislation –which will take time to develop.	- Sound management systems for plantation, and encourage monitoring, etc. - Aim for regional/district legislation (like in Brazil) rather than (or as well as) national.
Highest standards are unrealistic without sufficient resources but practical/realistic guidelines may lower standards too much.	Promote highest standards while suggesting minimum acceptable practices.
Often one group may benefit from promoting the cultivation of an invasive species while another group is affected by the costs of it.	Accountability and enforcement is difficult, especially when several smaller fields are producing the same invasive feedstock (see diagram 1). Encourage a separate fund/industry tax to pay for clean-ups?

Diagram 1: graphic illustrating accountability issues at stake around several small plantations (A.Witt)

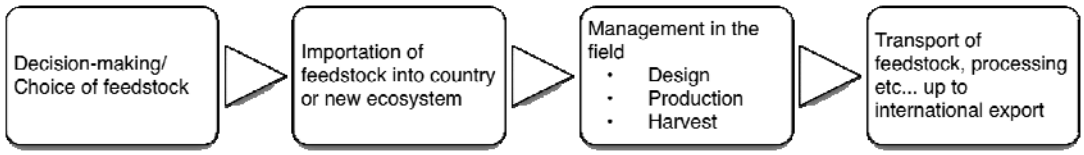


4 Invasive issues along the biofuel supply chain

Managing Invasive Risks along the Biofuel Supply Chain

As a way to more easily focus on how the risk – and therefore action points – change along the supply chain, a simple supply chain was constructed (see diagram 2) upon which to base group discussions.

Diagram 2: Summary of key points along the supply chain



Cross-cutting issues

The following issues were raised repeatedly and appear to be relevant to all phases of the biofuel production pathway, as such they are considered as cross-cutting issues which should be kept in mind at all times.

- The development of sustainable cost recovery mechanisms to support the development and implementation of all appropriate tools and frameworks for avoiding, mitigating and managing the risks of invasion related to biofuels production. This applies equally to private investors and producers, as well as governments, although the funding mechanisms may vary. Two possible approaches might be the “polluter pays” approach or government taxation.
- Participants recommended avoiding or eliminating parallel processes between government departments and international regulatory bodies to create clearer and more easily enforceable regulatory frameworks.
- Capacity building was repeatedly raised as a key issue. For best effect it should be focused on key stakeholders such as NPPOs and customs officials to improve law enforcement.
- Public awareness raising through education campaigns (and guidance from organizations such as IUCN, through projects such as this one).

1. Feedstock Selection and Development and Feasibility Assessments

1. Potential Invasive Issues (Vectors and Pathways)

- Comparison of risks between new introductions and the use of native species
- Risk from breeding and subsequent changes to genotypes, cross-pollination with wild relatives
- Knowledge of growth and reproductive characteristics, yield potential

2. Frameworks/Tools/Approaches

- Government funded/implemented SEA including socio-economic issues and invasive risk assessments
- International and national legislation to include invasiveness aspects
- (All) EIAs to include consideration of biological invasions (include requirement for pest risk assessment)
- Cost-Benefit analysis to include costs of potential invasion
- Contingency funds should be deposited in case risks of invasion become realities and mitigation is needed

3. Best (and worst) Practices

- Good information on potential biofuel feedstock species including economic viability
- Choice of feedstock with “no risk” of invasiveness
- Detailed mitigation plan prepared for managing a possible invasion
- Early screening for invasive potential to reduce costs of feasibility studies of unsuitable species
- Public awareness campaigns to increase understanding of risks, and need for precautionary approach to introductions

4. Key Actors and Capacity Needs

- Government and particularly NPPOs
- Scientists with relevant interest and expertise
- Private investors
- General public/farmers

Capacity needs include:

- Training for risk assessments, EIA
- Taxonomic knowledge, species recognition and data on feedstock species and possible pests and diseases
- Equipment and information/literature/databases
- Funding for biological invasion avoidance and management
- Public information campaigns need funding

2. Importation of propagules (seeds, germplasm etc…)

1. Potential Invasive Issues (Deficits, Vectors and Pathways)

- People carry propagules – trucks, ships, planes
- Machines and animals may be vectors
- Illegal entry (bypassing of NPPOs) is the main challenge
- Lack of border control capacity is a key deficit
- Control focuses on national or regional bloc borders whereas invasive risk is determined by natural ecosystem boundaries
- Trade and trade laws exacerbate risks
- Emergency food aid is another possible risk

2. Frameworks/Tools/Approaches

- WTO, IPPC, CBD
- National regulations on plant protection, customs, quarantine, immigration, environmental protection and national biofuel guidelines
- Education and outreach to encourage support for existing systems
- Self-regulation around a Code of Best Practice possibly including third party verification and certification
- SEA/EIA/Weed Risk Assessments (WRA)
- Sustainable cost recovery mechanisms

3. Best (and worst) Practices

- Always conduct risk assessment ***before*** importation
- Strong enforcement of laws and appropriate penalties or deterrents (or incentives)
- Strong involvement and compliance of stakeholders
- Ensuring all imports are accompanied by legal phytosanitary certificates
- Routine monitoring for possible escapes and subsequent invasion
- Learning from best practices such as Biosecurity systems of Australia and New Zealand
- Publicity of purpose of import permits to general public
- Development of a co-ordinated regional approaches

4. Key Actors and Capacity Needs

- COMESA and member governments, customs officials
- Investors
- Public, farmers
- Researchers/Scientists
- Certification bodies

Capacity needs include:

- Quarantine facilities and taxonomic skills
- Customs and law enforcement training
- Research funding
- Cost recovery mechanisms

3. Production of biofuel feedstocks

1. Potential Invasive Issues/Risks (Vectors and Pathways)

- Escape of propagules into natural environment
- Intentional introduction without WRA
- Economic sustainability (abandoned feedstocks more likely to result in invasion)
- Introduction of associated pests and diseases
- Site selection and scale for feedstock production

2. Frameworks/Tools/Approaches

- Landscape level land use planning to identify suitable sites and scales of production
- Guidelines for outgrower schemes
- Environmental Management Plan to include:
- Contingency control plan for risks internal and external to the plantation
- Monitoring and evaluation (audited by a third party)

3. Best (and worst) Practices

- Sensitivity mapping for biodiversity hotspots, water catchments, HCV areas etc..
- Compliance to any national and regional guidelines
- Use of lowest risk feedstock species or sterile varieties
- Establishing early warning systems
- Minimising disturbance of adjacent natural areas
- Use of host-specific biological control agents
- Weeding/fencing/mowing/dips
- Consider introduction of invasive “hitchhikers”
- Reduce accidental introductions with equipment during site preparation and construction (wash vehicles and equipment before first access to site)
- Regular monitoring for escapes
- Education of farmers to discourage spread of feedstock to local farms

4. Key Actors and Capacity Needs

- Producers/Farmers need training in good practices
- Developers/investors need clear communication of long term economic benefits of good practices despite higher production costs
- Government extension officers, inspectors need training and resources

4. Transport, Processing, Trade and Export Stages
1. Potential Invasive Issues (Vectors and Pathways) • Vectors include people, vehicles, animals, packing materials, soil, clothing, ships, trains, pipelines, roads, drains, irrigation canals, run-off
2. Frameworks/Tools/Approaches • WTO, IPPC, CBD • Export certification processes • Labelling systems • MOUs between suppliers, traders and purchasers/retailers
3. Best (and worst) Practices • Convert feedstocks to biofuels on-site, or at least in-country • Contain farm products on site (change clothing, clean vehicles) • Care in transporting • Notify recipients of reproductive characteristics and other risks • Sensible waste management (incineration vs. composting of high risk materials) • Kenya flower growers model of best practice • ZEGA (Zambia org?) • Regular inspection and monitoring along pathways
4. Key Actors and Capacity Needs • Government – capacity building for customs, law enforcement • Traders need to be on board and informed of invasive risks • Transporters need to understand the rationale for regulations • More understanding is needed of possible vectors and pathways • Better understanding of the life-cycles of feedstocks and their pests and pathogens

5 Suggestions for outputs

During the discussions, specific suggestions for outputs were collated and summarised, as below. These were used to develop the draft framework of the guidance document.

- **Facts**
  - Clear, easily understood facts on risks of biological invasions and biofuels (including terminology) implored
  - A simplified invasives concept to make understanding of this complex issue easier.

- **Targeted guidelines**
  - Shouldn't re-invent the wheel (e.g. ICRAF internal policy guidelines)
  - Risks and concepts of invasion should be widely circulated – awareness-raising
  - Target producers and investors and government decision-makers
  - International and regional instruments may be helpful (CBD, IPPC, African Convention of Nature and Natural Resources, NEPAD Environment Programme, RSB, IUCN Invasive Species Specialist Group, GISP, COMESA)

- **Biofuel decisions**
    - Optimal combinations of species and localities (both of feedstock selection and management)
    - How to mitigate sub-optimal levels, including how to reduce invasion risks
    - Crop selection criteria – need risk assessment and economic assessment (including opportunity costs)
    - "Missed the boat" on 1st generation crops, focus on 2nd generation crops including fast growing grasses.

- **Incorporate invasives in assessments**
    - Tools integrating environmental issues- biodiversity and the problem of invasion within development projects e.g. SEA, EIA tools and guidelines already exist and are essential to make things happen.
    - Emphasise importance of implementation of the EMPs which will address environmental challenges.

- **Context of invasives in biofuel developments**
    - Access to energy/need for energy alternatives
    - Development risks
    - Economic risks
    - Few have listened on invasives issues before! How to communicate differently?

- **Two-level approach – linked legislation and guidelines**
    - Short-term and long-term recommendations
    - Biofuel Policy framework and investments are moving fast - we need something useful right now, not in ten years time.
    - Industry should be encouraged to comply with legislation and guidelines - because this will help the success of biofuel ventures for all

6 Proposed structure of guidance document

- Rationale for the guidance – biofuels introducing new invasive species risk to the region, that are likely to get worse with 2nd Gen, needs intervention ASAP.
- "Alien Alert" and the context of the launch of the project
- Stress the links between invasive species and loss of biodiversity
- Recognise the many opportunities of biofuels
- Common misconceptions and facts related to invasive species including a box on examples of invasion and the causes historically – e.g. sisal, prosopis, castor oil plants, oil palms, black wattle in SA
- Recognise other issues surrounding the biofuel debate which are important such as tenure land, GHG, rural development prioritisation of biofuels, access to energy in rural areas etc… however, this paper will focus on the specific linkages between commercial scale biofuel developments and invasive species risks especially in Eastern and Southern African Region, which are already apparent and likely to be exacerbated in the near future.
- Clarify the initial target audience – RSB and its Principles & Criteria and therefore the Investors, Producers, Suppliers and Governments that are members of the RSB, available in a format for other interested actors to access and implement.

Guidance of possible intervention points along the biofuels supply chain from 1–4

1. Feedstock selection and development, and feasibility assessments

Ideally national governments should conduct a full SEA alongside an EIA funded by the developer but, as a minimum, developers should conduct a strategic selection of the feedstock species and a WRA to identify the potential threat of invasion by the feedstock being considered.
Include the possible costs of invasion into cost-benefit analysis.

2. Importation of feedstocks/propagules

Compliance by the importer with all national regulations relating to introduction of live plants or propagules, risk assessments and quarantine – implementation issues with existing legislation
Box to be developed on how assessments should be based on ecosystems rather than national boundaries e.g. Australia. Within the area covered by COMESA the risk is likely to increase
Recommend development of industry-led self compliance for the benefit of industry! Potential for future certification (RSB?)

3. Feedstock Production

EMP should include:
Creation of a contingency plan and fund (funds should be external – held by govt) Requirement for insurance? Deposits for production licenses?
Development and implementation of a monitoring system that checks for escapes
Includes best practices for risk reduction e.g. Biological control, fencing, weeding, use of sterile varieties, pre fruit/seed harvesting, IPM best practices etc…
EMP should be audited by a third party
EIA requirements and agricultural regulations need to incorporate IS issues

4. Transportation

Clarify that this includes all risks related to invasion once the feedstock has left the field
Containment of propagules on site and recommendation that ideally there should be on-site conversion to an inert tradeable product (if not the finished tradeable fuel) – Outline environmental and economic benefits of this.
Awareness of transporters in relation to propagules.

Finally – Summarise the limitations and challenges to the successful implementation of our guidance and recommendations, focusing on regional context.
Awareness raising
Money/Funding
Capacity building – identify key centres?
In order to put in place the above, there are some universal requirements such as sufficient funding mechanisms that promote the polluter pays principle?
Possible cost-recovery options….

7 Next steps and timeline

The table below outlines next steps to be taken by the group to move the project forward.

23-26th April	- news story on IUCN website (Nadine McCormick and GH) - news story sent to Bioenergy Business (Geoffrey Howard) - workshop report circulated (Sam Keam, Eva Kassara and Nadine) – with comments due by 30th April - presentations and reference documents online (Sam Keam and Nadine) - suggested changes sent to the Roundtable on Sustainable Biofuels (Nadine McCormick)
4th May	Comments on workshop report incorporated, final version put online (Sam Keam)
5-8th May	Council of Europe meeting – invasive species strategy (Sarah Simons)
18th May	**Draft framework sent to workshop participants for 3 week comment period (Sam Keam)**
22nd May	International Biodiversity Day – focus on invasive species. *Press release from GISP and IUCN? Earlier than the big day? (Geoffrey Howard and Sarah Simons?)*
Last week May (TBC)	COMPETE Biofuel Policy meeting in Zambia, with RSB (Graham von Moltitz, Brian Nkandu and/or Lovemore Simwanda to present early results from workshop?)
May - October	East African Roundtable on Sustainable Biofuels, led by WWF Sweden
8th June	**Comments due on draft guidance document**
Mid-June (TBC)	Addis Ababa Biofuels Association workshop – to target for presentation? Rezene Fessehaie?
30th June	**Revised version of guidance document available for general comment over the summer period before the follow-up workshop**
August	Environmental Management of Alien Plants (EMAP) Conference (Ryan Blanchard presenting?) Australia – biofuel conference? Further information required…
September (TBC)	**Workshop 2 – testing the guidance document**
	Other private sector/government biofuel meetings to be especially targeted. Please help us to identify them!

ANNEXES

Expectations from the workshop

After the introductory presentations, participants noted their expectations. They can be grouped accordingly:

Biofuel strategies and decision making

- advice for government policy making on optimal combinations of biofuels in a given landscape
- how to select crops for biofuels production
- different land tenure system implications of large-scale investment (acknowledged as outside the scope of the workshop)

General biofuel implementation

- monitoring of environmental and social impacts of biofuels

Biofuels and invasives

- what to put in an Environmental Management Plan related to possible biological invasions
- how to develop biofuels without exacerbating existing invasive species problems
- how to package information on biofuels and invasive species for easy understanding by politicians and other leaders
- is it better to stop a potential invasive biofuel feedstock from entering the country or have a system of accountability in place for introduction?
- how can we carry out better screening and risk assessment of potentially invasive biofuel species, given their expense (for example, through EIA?)
- how best to convince governments that biological invasions are a problem, and that utilization alone is not a solution?

Outputs of project

- a set of draft, pragmatic guidelines for biofuels in relation to invasions (risk assessment is ideal, both in terms of skills and cost).
- a good skeleton of the outputs
- learn from stakeholders in the region
- suggestions for how to improve EIA/EMS tools
- change misconceptions about biological invasions!

Presentations given

Day one

- *Introduction to the project – Geoffrey Howard, IUCN*
  http://cmsdata.iucn.org/downloads/01__introduction_to_the_project_wkshp_one__g_howard.pdf

- *The biofuels context: alternative energy sources and the role of biofuels – Nadine McCormick, IUCN*. A background to why IUCN considers biofuels to be an important issue along with a quick overview of biofuels in the context of changing energy needs.
  http://cmsdata.iucn.org/downloads/02__biofuels_context__biofuels_and_invasives__iucn_nairobi_20_april_09_nm.pdf

- *The invasive species context – general principles – Geoffrey Howard, IUCN.* A background to the issue of invasive species, the processes of invasion and clarifications on a number of common misconceptions about invasive species.
  http://cmsdata.iucn.org/downloads/03__the_invasive_species_context_wkshp_one__g_howard.pdf

- *The Status of Biofuels in Ethiopia: Opportunities and Challenges – Rezene Fessehaie, Ethiopian Institute of Agricultural Research.* An overview of the Ethiopian context where high yielding biofuels production from sugar cane and other crops is being promoted. Rezene highlighted many of the challenges in planning biofuel production around competing needs for biodiversity conservation and food production, and also showed examples of impacts from invasive species in Ethiopia.
  http://cmsdata.iucn.org/downloads/04__status_of_biofuels_in_ethiopia__rezene_fessehaie.pdf

- *Managing Biodiversity Risk For Biofuels – Kirsten Roettcher, SEKAB, Tanzania.* SEKAB brought a useful private sector perspective the workshop's discussions. Kirsten presented the measures SEKAB has taken to plan their Tanzanian operations so as to minimize negative effects on biodiversity and local communities, and maximize economic benefits whilst also increasing awareness of invasive risks.
  http://cmsdata.iucn.org/downloads/05__managing_biofuels_and_invasives_sekab_k_roettcher.pdf

- *Investment and development issues related to biofuels in Zambia – Lovemore Simwanda, Investment Commission of Zambia.* Lovemore described the increasing interest and investment in biofuel development in Zambia and the roles played by various land tenure systems as well as the development of a National Biofuel Council.

- *Ugandan experiences of biofuels and invasive species issues – Gadi Gumisiriza, NARO, Uganda.* A brief summary of the current status of the Ugandan biofuel industry and ways that invasiveness are tackled by the National Agricultural Research Organisation.
  http://cmsdata.iucn.org/downloads/06__uganda_perspectives_biofuel_production_and_invasive_species__g_gumisiriza.pdf

- *Biodiversity concerns from indigenous biofuel plant domestication – Graham von Maltitz, CSIR, South Africa.* Graham challenged the assumption that native species are inherently safer as feedstocks and explained the mechanisms that can result in invasion by indigenous species due to degradation by altered grazing, changed fire regimes and climate change. The issue of plant breeding and the risk of cross-pollination with wild relatives was also raised.
  http://cmsdata.iucn.org/downloads/07__biodiversity_concerns_from_indigenous_biofuel_plant_domestication___graham_von_ma.pdf

- *WWF's Perspectives on Biofuels and the current situation in Tanzania – Peter Sumbi, WWF Tanzania.* An overview of WWF's work in Tanzania and the biodiversity impacts of current and planned biofuel developments in the country.
  http://cmsdata.iucn.org/downloads/08__wwf_tanzania_regional_biofuel_workshop___nairobi_20_april_2009_small.pdf

- *Growing of Jatropha curcas L. and the potential of it becoming invasive in Zambia – Brian Nkandu, Environmental Council of Zambia.* Brian presented the plans Zambia has for development of Jatropha plantations for biofuels as well as the ways in which Zambia will attempt to manage the risk of invasion.
  http://cmsdata.iucn.org/downloads/09__jatropha_curcas_and_invasion_in_zambia__april_2009_b__nkandu.pdf

- *Jatropha as a potential biofuel in the drylands of IUCN PACO countries – Seynou Oumarou, IUCN PACO, Burkina Faso.* Seynou presented case studies from West Africa where Jatropha is being developed at smaller scales to promote rural development benefits through intercropping systems, off-grid electrification and other examples.

  http://cmsdata.iucn.org/downloads/10__jatropha_in_paco_drylands__s_oumarou.pdf

- *Do potential biofuel crops have invasive species traits? – Arne Witt, CABI Africa, Kenya.* A more detailed look at the many traits that current and proposed biofuel feedstocks posess which are likely to exacerbate the risk of invasion.

http://cmsdata.iucn.org/downloads/11__do_potential_biofuel_crops_have_invasive_species_traits__arne_witt__cabi_africa.pdf

Day two

- *Risks of invasion from biofuel feedstocks – terrestrial, freshwater and marine – Geoffrey Howard, IUCN.* A summary of the risk of invasion by biofuel feedstocks, pests and diseases that may spread due to biofuel developments in terrestrial, freshwater and marine settings http://cmsdata.iucn.org/downloads/12__risks_of_invasion_from_terrestrial__freshwater_and_marine_feedstocks__g_howard.pdf

- *Risks of invasion by pests and diseases – Abed Kagundu, KEPHIS, Kenya.* An overview of the approaches used by the Kenya Plant Health Inspectorate Service to avoid and manage the risks of invasion. http://cmsdata.iucn.org/downloads/13__risks_of_invasion_by_pests_and_diseases_abed_kagundu__kephis_2104_09.pdf

- *Concepts of risk and existing invasive risk assessment – Sam Keam.* An overview of risk and possible levels of intervention to avoid, minimize and manage risks, particularly with pest risk assessments. http://cmsdata.iucn.org/downloads/14__concepts_of_risk_and_invasives_sam_keam.pdf

- *Developing best practices – Setting our proposed work in context – Nadine McCormick, IUCN.* Nadine summarised the work of the Roundtable on Sustainable Biofuels and a number of other fora that are relevant when developing guidelines to complement existing efforts to manage the social, environmental and economic risks and opportunities of biofuels. http://cmsdata.iucn.org/downloads/15__rsb_vzero_invasives_21_april_2009_nm.pdf

Day three

- *An Introduction to the framework of the guidance document* http://cmsdata.iucn.org/downloads/16__introduction_draft_framework_of_the_guidance_document.pdf

- *Managing biodiversity risks – further experiences from SEKAB – Kirsten Roettcher, SEKAB.* A more in-depth look at the opportunities and challenges for private investors and developers in Tanzania.

Workshop Evaluation

Thanks to the workshop participants who provided useful and constructed feedback. Overwhelmingly the workshop was successful, with an average score of 3.2 (1 poor – 4 excellent). Most participants appreciated the background document and the open structure of the workshop, which allowed everyone to participate, sharing experiences and engaging in useful discussions. Knowledge on biofuels and invasives (both separately and linked) was also appreciated, reflecting the diversity of expertise in the room.

Next time, we will look to improve the diversity of stakeholders (including public and private sector participants) as well as provide more time for specific case study presentations. Costs are, of course, a big limiting factor to the workshop venue (which is why the IUCN meeting room was used) and so travel from the hotel was unavoidable. Several participants suggested a field trip. We will look into costs and timing and try to arrange this for next time. Further comments/suggestions are welcome!

Further resources mentioned in the workshop

IUCN (2009) Biofuels and Invasive Species: Exploring links between biofuel production systems and invasive alien species. 24pp.

IUCN (2009) Biofuels and Invasive species: A guide to best practises of biofuel production. Systems for Eastern and Southern African Region.

www.biofuelexperts.ning.com – online network established by CABI (ask Arne Witt for more info)

Buddenhagen CE, Chimera C, Clifford P (2009) Assessing Biofuel Crop Invasiveness: A Case Study. PLoS ONE 4(4): e5261. doi:10.1371/ journal.pone.0005261
http://www.eurekalert.org/pub_releases/2009-04/plos-bpi041709.php