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Ukrainian biomass sustainability

Assessing the feasibility of sustainability standard implementation and producer compliance in Ukraine


Project Pellets for Power: Sustainable Biomass import from Ukraine

Sustainable Biomass Import Program – NL Agency – Netherlands

Ronald Poppens, Tjipke Hoekstra



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Colophon

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Date of publication: October 2013

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Summary

Biomass sustainability is determined by the impact of biomass operations on people, climate and the environment. Some impacts are easier to assess than others, with so called indirect effects being the greatest challenge, for they often occur far beyond the project boundary and which are not (yet) included in certification systems. The criteria by which to judge sustainability impacts are laid down in standards. The Dutch NTA 8080 standard is one of the most comprehensive sustainability standards for biomass available and is one of several officially accepted standards by the European Commission. Conformity with standard requirements is assessed in a process called certification. This process is carried out by independent Certification Bodies.

One of the objectives of the Pellets for Power project was to align biomass operations with the NTA 8080 standard. With no functional supply chains developed during the course of the project, a complete conformity assessment, covering all NTA 8080 provisions, was not possible. For the remaining provisions, the project has had to rely on assumptions based on fictional but realistic supply chains as planned by the project partners. Also, the emphasis was on the reed chain. With project partners successfully obtaining reed harvesting permits, reed became the most realistic resource for development in the short term and conformity of the proposed reed chain set-up was analysed against NTA 8080 certification system. Generally, the analysis results show that NTA 8080 certification for reed based pellets under our set-up should in principle be possible in Ukraine.
First the legal issues were addressed. Project partner Phytofuels identified Ukrainian laws and legislations regarding the right to use Reed biomass in conformity with the NTA 8080 principles. This focused on analysis of reed legislation and permit procedures and on how to obtain licenses and for mobilizing community ownership for legal reed harvesting. This was essential for the stakeholder consultation process, which resulted in broad support within the community, making the project at the same time less vulnerable to corruption and helped to acquire the permits and agreements for reed harvesting.
The issue of minimal GHG (greenhouse gas) balance was analysed for the proposed production chain from harvest to utilisation in Ukraine or the Netherlands. It showed an improvement of more than 70% over the fossil fuel equivalent when used for electricity production in The Netherlands or for heat production in Ukraine.
Both in the RED (renewable energy directive) and in the NTA 8080 there are limits to the use of peat land. Reed lands in the project area can be found on both mineral soils and peat land. One of the main reasons to prohibit the use of peat lands both in the 2009/28/EC Renewable Energy Directive (Article 17.5) and the NTA 8080 (Article 5.2.2) is that exploitation of these areas will result in large CO_2 emissions when draining of the area takes place. Emissions will amount to such levels, that it becomes impossible to regain these losses by means of renewable energy production. The RED provides the exception where "evidence is provided that the cultivation and harvesting of that raw material does not involve drainage of previously undrained soil. It is fair to assume that this exception should be acceptable to NTA 8080 as well, but some addendum may be needed.
Competition with food and local biomass uses was also analysed and this is also related to the so called iLUC effect (indirect Land Use Change). Here it was argued that the reed has no or few alternative local uses and is often burned to provide access to water. It was concluded that a large part of reed can be used without effect on competing applications.
For switchgrass produced on previously unused or marginal land a similar conclusion could be drawn. The conclusion is that ILUC can be minimized by growing switchgrass when cultivated on

less productive or abandoned land, but this comes at an expense, in the form of higher cultivation costs and a less favourable – though still adequate – GHG balance.

Biodiversity and environmental integrity was assessed in depth for the proposed reed chains in the project area. A set of best practices for biodiversity in reed harvesting was developed, which include a recommendation to harvest only part of the area, and leave at least 25% of older reed and natural areas. Further, the site selection is important, taking care to avoid protected areas and wetlands to abide with Ukrainian law. The wetland should be maintained as much as possible in its natural state, and protected against fires. It was concluded that biodiversity can be maintained or even improved if best practices for reed management are implemented.
Regarding the provisions about the Environment, emphasis was placed on soil quality issues regarding the straw chain. Model simulations showed that when straw is removed for bioenergy, under current management practices, there is a risk of decline in soil organic matter which is explained by a relatively low productivity, low nutrient applications and little use of organic manure. Straw harvesting may therefore lead to incompliance with provision 5.5.1.2 of NTA 8080 and is thus not recommended under current management practices.
Overall NTA8080 certification seems possible. However, also some non-conformity risks were identified, regarding certain provisions for legislation and stakeholder consultations. These issues are strongly related to the difficult circumstances in Ukraine, with legislative ambiguity, poor law enforcement and particular power balances in communities. Therefore, the future for certified sustainable biomass produced in Ukraine depends on concerted action on multiple levels, between governments, legislators, law enforcers and biomass producers. But also standard developers and Certification Bodies can help improve the implementation of sustainability standards. Among other, this requires adjustments to used terminology and improved methods for verification for better practicality in the context of Ukraine.

Content

Introduction

This report was produced in the framework of the Pellets for Power project, funded by NL Agency under the Ministry of Economic Affairs in the Netherlands. This project was carried out between April 2010 and May 2013.

The project objective is the development of sustainable supply chains for biomass produced in Ukraine, based on three biomass sources; reed, switchgrass and straw. In order to guarantee sustainability, the biomass operations had to be tested for conformity with the Dutch NTA 8080 sustainability standard. For lack of functional supply chains during the course of the project, only part of the NTA 8080 provisions were addressed in the project conformity assessment. For the remainder of sustainability provisions, the project relied partially on assumptions based on reliable projections.

This report consists of three parts. In the first chapter the concept of sustainability is explained and a distinction is made between direct and indirect impacts of biomass operations. Also the NTA 8080 sustainability standard is discussed, as a tool for sustainability implementation, as well as the procedure for companies to become certified in accordance with this standard.

Chapter 2 analyzes project conformity with a number of sustainability requirements in the NTA 8080. Sections in this chapter each relate to one specific set of sustainability requirements. The information for this assessment is found in other project reports, to which references are provided in each section.

The third chapter addresses important obstacles for successful implementation of NTA 8080 in Ukraine. These obstacles are strongly related to the context of Ukraine, with legislative ambiguity and problems with law enforcement and power structures. Also some recommendations are provided for improvement, requiring concerted actions among stakeholders.

Finally, conclusions are provided as to the feasibility of sustainable biomass and biomass certification in Ukraine. Recommendations are given for national stakeholders involved in developing legislative and policy frameworks in which biomass actors operate. Also, standard owners, developers and Certification Bodies are encouraged to improve practicality of standards like NTA 8080 in the context of Ukraine.

The authors trust that this report will be of value for current and future biomass businesses, as well as for Certification Bodies, governments, legislators and others interested in sustainable biomass from Ukraine and perhaps elsewhere. This report as well as other results of the Pellets for Power project are found on http://www.biomassandbioenergy.nl/ukrain/Intro.htm and on the website of NL Agency.

The Pellets for Power project and its partners do not accept responsibility in case of any falsehoods or implications of information written in this document.

1 Biomass sustainability

1.1 Measuring impact on people, climate and environment

In the production, processing and application of biomass, sustainability is assessed principally through its impact on people, environment and climate. This includes for example the impact of the use of fertilizer or herbicides in the production of biomass. Other effects relate to biodiversity and local communities where the biomass is produced or processed. Also greenhouse gas emissions are important. These are released by using fossil fuels in the supply chain, but also by burning harvest residue on the land. A potential positive impact is achieved when biomass replaces fossil fuels, in the production of heat and electricity for example.

Direct effects

A distinction is made between direct and indirect sustainability effects of biomass. Effects are considered *direct* if these can be related unambiguously with the production, processing and applications of biomass on a given location in the supply chain. Effects on soil quality, for example, can be measured directly through taking soil samples for analysis, before and after biomass cultivation. En through social research it can be measured to what extent the local population has benefitted from a given biomass project.

Indirect effects

Indirect effects are much more difficult to measure. These effects may occur if biomass is produced on agricultural land, resulting in food price increase and subsequent land conversions. When additional land is thus claimed for biomass production, on those sites additional *direct* effects will occur. Globalisation and international trade cause these indirect effects to occur often far beyond the influence of the biomass project or even beyond national boundaries. This is exactly why indirect effects are so difficult to assess.

Sustainability standards and certification

Sustainability is assessed through criteria established in official standards. Some standards have become mandatory with its criteria laid down in legislation. This is the case with the Renewable Energy Directive for example which is now incorporated in national legislation of EU countries. Other criteria and standards are voluntary. This is the case with NTA 8080 for example, that since September 2012 has been officially accepted by the European Commission. Companies and organizations throughout the E.U. now have the possibility of certifying biomass operations in accordance with NTA 8080 and other accepted standards.

Measuring carbon sequestration

1.2 NTA 8080 and 8081

The European Commission and the Netherlands have set ambitious targets for making their energy production more sustainable. Biomass is considered an important source of sustainable energy, albeit that large import volumes will be required that need to be matched with clear sustainability rules. On European level and in various European countries sustainability criteria have been developed. An example is the Testing Framework for Sustainable Biomass, also known as "Cramer Criteria" developed by the Dutch government. Separately the European Committee has developed the Renewable Energy Directive (Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources). This directive partly addresses the same issues and acts as a meta standard for standards to be developed per member state. It is included in European legislation.

The Cramer Criteria formed the basis for development of the Dutch NTA 8080 standard. This standard has been developed by a collective of organizations, united in the Committee of Experts.
This Expert Committee is the panel where new developments of the standard are decided. Unlike the RED, sustainability criteria of the NTA 8080 not only apply to biofuels and bioliquids for transport (Article 17 of the RED), but also to solid biomass. In addition, the NTA 8080 includes requirements to the company regarding welfare and well-being. The RED requires the Commission to report to the European Parliament on a biennial basis on ILO conventions, the Cartagena Protocol and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).
The NTA 8080 describes the minimum requirements that organizations need to comply with, in the production, conversion, trading, transport and/or use of biomass for energy purposes. The NTA 8080 is a voluntary standard, whereas the RED contains European agreements on levels of emission reductions and has been implemented in Dutch legislation, as of December 2010.

Also since December 2010, the NTA 8081 has been in effect. This tool helps to assess conformity with NTA 8080 requirements in a process called certification. It includes requirements for independent, third-party organizations that carry out the certification; the so called Certification Bodies. Certification is "the procedure by which an independent body gives written assurance that a product, process or service conforms to specified requirements" (source: website FSC). However, 100% - assurance is difficult to provide. That is why certificates often state that, based on the assessment, "the CB declares to have a justifiable confidence that the product will comply with NTA 8080 requirements".

Certification Bodies are accredited by their national accreditation body. The owner of the certification scheme is the Dutch Standardization Organization NEN. CB's must apply the NTA 8080 standard in accordance with requirements set by NEN in the NTA 8081.

NTA 8080 promotion event in Kyiv, September 2012

1.3 Steps in the certification process

A successful certification process ends with a Certification Body granting a certificate to the applicant. Depending on the certification system, certificates may be issued for different scopes.

Different types of certificates are issued. Usually a distinction is made between certificates for resource managers and land owners one the one hand and certificates for companies in the chain of custody on the other hand. Companies in the chain of custody include traders, manufacturers and processors of biomass. Group certificates are available for groups of smallholders who, on an individual basis, cannot meet the financial and procedural obligations of a certification system.

A NTA 8080 certificate provides credibility to biomass based companies. With it, they can show they are committed to protect the environment and fight poverty and climate change. This may incentivise companies to work sustainably, even in the absence of national legislation. Investing in certification now, before it becomes mandatory, will ensure a company is ready for sustainable biomass production before his competitors are.
Roughly, the following steps apply for resource managers, landowners and companies towards certification of their biomass-based operations:

- The client contacts a Certification Body (CB) for basic information about requirements, costs and time needed.
- An agreement is signed between the client and a CB of choice, based on the information provided by the client to the CB
- The CB performs an audit, assessing to what extent current operations match certification requirements.
- In case of non-compliance, the client must first make adequate changes in operations and provide the CB with ample prove that corrections and corrective actions have been taken to solve the shortcoming. The CB will assess this prove by means of an administrative assessment or by a site visit.
- The CB draws up an audit report and – in case all certification requirements are met – grants a certificate.

A NTA-8080 certificate has a validity of 5 years. Yearly audits are performed by the CB to ensure long-term compliance with the NTA 8080 sustainability requirements.

GHG emissions from reed burning

1.4 NTA 8080 Sustainability requirements

In principle, organizations that seek NTA 8080 certification would need to comply with all sustainability requirements listed below. "Smallholders", i.e. small family based businesses, only need to comply with the provisions of 5.2.1 and 5.5.2, dealing with the greenhouse gas balance and the preservation and improvement of soil quality (under environment), respectively.

- General requirements
    - Documentation
    - Laws and regulations
    - Stakeholder consultations
- Greenhouse gas emissions
    - Greenhouse gas balance
    - Important carbon stocks

- Competition with food and local applications
- Biodiversity
- Environment
    - Soil
    - Water
    - Air
- Prosperity
- Social well-being

1.5 NTA 8080 provisions covered by the project

In the Pellets for Power project it was not possible to assess project compliance for all provisions in the NTA 8080 standard. The lack of continuous commercial biomass operations by the project partners meant that much data required for NTA 8080 compliance assessment could not be gathered. This is especially true for the provisions grouped under Prosperity and Social wellbeing, with the exception being an analysis of job years created (chapter 11 in report by Sluis *et al*, 2013). *Table 1* provides an overview of NTA 8080 provisions covered by the project, a description of respective project activities and the reports where the activities and results are documented.

Reedland in the project area

Provisions regarding the greenhouse gas balance are based on a fictional supply chain set up, which is extensively described in the project report by Poppens *et al*, 2013b. This analysis was performed for all three biomass chains. Most other provisions that were covered focus on the reed chain, given the relative importance of sustainability issues such as biodiversity and environmental impact. Also the legislation studies and stakeholder consultation activities focus on the reed chain, for they coincided with real-time harvesting permit procedures led by project partner Phytofuels. A soil impact study was performed for the straw chain, given the inherent risk of reducing soil organic content by removing straw from the land. Lastly, the job year analysis was performed for general biomass operations, not for any particular biomass chain.

Table 1: *NTA 8080 sustainability provisions, related project activities and reports*.

Sustainability provisions	**Project activities**	**Project reports**
Legislation (5.1.2). Focus on the reed chain.	Analysis of reed legislation and permit procedures; obtaining licenses.	*Taking the Law to the People* – mobilizing community ownership for legal reed harvesting in Ukraine. (Poppens et al, 2013a)
Stakeholder consultations (5.1.3). Focus on the reed chain.	Engaging with local reed communities and authorities for permits and agreements for reed harvesting.	*Taking the Law to the People* – mobilizing community ownership for legal reed harvesting in Ukraine. (Poppens et al, 2013a)
Greenhouse gas balance (5.2.1). Focus on all three biomass chains.	Calculating GHG emissions and savings throughout the supply chain for different chain configurations.	*Herbaceous biomass supply chains* – assessing the GHG balance, economics and ILUC effects of Ukrainian biomass for domestic and Dutch energy markets. (Poppens et al, 2013b)
Competition with food and local biomass uses (5.3). Focus on ILUC with emphasis on the switchgrass chain.	Integrated GHG, economics, and ILUC analysis for switchgrass cultivation on highly productive and less productive land.	*Herbaceous biomass supply chains* – assessing the GHG balance, economics and ILUC effects of Ukrainian biomass for domestic and Dutch energy markets. (Poppens et al, 2013b)
Biodiversity (5.4). Focus on the reed chain.	Literature studies, assessment methodologies and field studies.	*Reed harvesting from wetlands for bioenergy* – sustainability and economic viability of reed harvesting in Ukraine. (Sluis et al, 2013)
Environment (5.5). Focus on the reed chain;	Literature studies, field studies.	*Reed harvesting from wetlands for bioenergy* – sustainability and economic viability of reed harvesting in Ukraine. (Sluis et al, 2013)
Environment - Soil Quality (5.5.1.2) Focus on the switchgrass and straw chains.	Carbon stock calculations of switchgrass land; Soil Organic Content balance for multiple management and straw removal scenarios	*Herbaceous biomass supply chains* – assessing the GHG balance, economics and ILUC effects of Ukrainian biomass for domestic and Dutch energy markets. (Poppens et al, 2013b)
Prosperity (5.6). Focus on biomass in general.	Analysis of job years created per Giga Watt-hour of energy generated, compared to fossil fuels and other non-fossil alternatives.	*Reed harvesting from wetlands for bioenergy* – sustainability and economic viability of reed harvesting in Ukraine. (Sluis et al, 2013)

2 Discussing Project NTA 8080 compliance

The project reports listed in *Table 1* above each cover one or multiple NTA 8080 sustainability aspects for one or multiple biomass chains covered by the project. In this chapter, the (future) project operations are analysed for conformity with these requirements. This analysis is based on information from other project reports (see References) with added information on (non-) conformity and recommendations for compliance improvements. The aim is not to give a final judgement, but to try and identify where activities have been in line with NTA 8080 requirement, where non-compliance might occur and where additional work needs to be done.

2.1 Legislation

2.1.1 Report summary

According to NTA 8080 paragraph 5.1.2, "the organisation shall enforce all applicable laws and regulations of the country of establishment, as well as international agreements and treaties which the country of establishment has signed and shall comply with the principles and criteria of this NTA." Furthermore, specific requirements concerning following laws and regulations have been laid down in chapters 5.4 (Biodiversity), 5.5 (Environment), 5.7.1 (Working conditions), 5.7.2 (Human rights) and 5.7.3 (Property rights).

As documented in Poppens *et al* (2013a), Phytofuels has gone to great length to identify Ukrainian laws and legislations regarding the right to produce biomass. They were not discouraged by lack of knowledge of government officials on several levels and their pursuing of the right way to go about it should be applauded. Setting up new protocols and developing interpretations in cooperation with the government, helping out other market participants and participating in working groups for further development of legislation, is exactly what sustainability standards like NTA 8080 are about. Also not giving in to an existing situation, where legislation may be present, but its interpretation and upholding is rather hampered by a long-standing culture of bribery and power-balancing, is impressive. It would for many people be all too easy just to go with the flow, claiming that they can't change society. Phytofuels is proving that they can. Also the effort by Phytofuels to acquire reliable maps and other proof of existing borders was correct. During an audit, the auditor will probably want to check on the ground if the maps are correct and accurate.

However, some critical observations and recommendations for improvement can be made, regarding their selective approach to legislation and NTA 8080 provisions. This is discussed in the following two sections.

2.1.2 Selective choice of legislation

It is clear and obvious that Phytofuels' principle interest was to understand the laws and legislations that concern obtaining permits. It has not become clear to what extend Phytofuels also identified and investigated other laws and regulations. For certification to become possible,

Phytofuel has to comply with all these other laws, such as those dealing with labour, health and safety, discrimination, water and air quality and other provisions.

2.1.3 Sacrificing one provision for another

Another recommendation to Phytofuels is to make sure not to sacrifice one NTA 8080 requirement for another. It was for instance stated in section 1.3 (Poppens et al, 2013a) that it may be interesting to include in the harvesting scheme reedland on the other side of the river bank, opposite of a protected area. Though production may be allowed in the vicinity of a protected area if local law allows for that (this clause is included in the NTA 8080), Phytofuels should also make sure not to infringe upon biodiversity provision 5.4.3. Here it is stated: "it is demonstrated that by biomass production the 'high conservation values' of an area is not affected". That provision also relates to neighbouring areas. It does not become clear whether or not Phytofuels has considered this and taken appropriate actions.

2.2 Stakeholder consultation

2.2.1 Report summary

Phytofuels' stakeholder consultation process is strongly linked with the permit procedure and legislative studies. Both are described in detail in Poppens *et al*, 2013a.

NTA 8080 states in paragraph 5.1.3.1 regarding consultation by biomass producers the following: "The organisation shall consult parties which in one way or another are interested in the region in which the production unit is being established or already established. Usually these parties concerned have a clear vote in the way the organisation can and may practice the exploitation of the production unit. According to the Interpretation document (NEN, 2010), the scope of the primary biomass producer concerns the area (and stakeholders in that area) where changes will take place as a result of activities in that area. These changes can be tangible due to changes in land use and construction of infrastructure and buildings, and not tangible as a result of changes in relations between the local residents and the primary biomass producer.

As with the efforts concerning legislation, Phytofuels has put much effort into stakeholder consultation. And again, they should be commended for not falling victim to bribery and opportunism. Getting it right must be quite a challenge if you have to circumnavigate power balances within a village community, but also between village officials, regional officials and government people. It seems Phytofuel has made a pretty good job of that. Looking at the specific requirements for stakeholder consultation, Phytofuels has paid attention to all segments and assumed responsibility where legislation and cultural structures obstructed the preferred way forward. Also the means of communication that Phytofuels chose seem to be effective. Efforts were made to make communication available and understandable to those people addressed.

However, some critical observations and recommendations for improvement can be made, regarding their approach to stakeholder consultations. This concerns their selection of stakeholders, gifts to communities and documentation of stakeholder complaints.

2.2.2 Choice of stakeholders

It would be recommendable for Phytofuels to lay down in writing the exact criteria applied to determine the plots of land considered for further development. It is also highly recommended that Phytofuels made a register of all applicable stakeholders per area. Within the context of Ukrainian society, choices that Phytofuel made, about which deputy to approach and which not, as in which level of government would be most effective to deal with, seem to be defendable, at least for now. But there is for instance no indication that other stakeholders than those directly locally involved where identified and approached. It seems that NGOs like WWF or Greenpeace might have some interest in what is going on. This would be an issue addressed during a NTA 8080 audit.

There is also a slight concern about the people that where included in the stakeholder consultation. In principle, the stakeholder consultation should give voice to all people, either in favour of or opposed to the project. As said, within the current playing field the choices Phytofuels made seem to be defendable. But several people were left out deliberately, in order not to hamper progress of the project. This may be understandable, but Phytofuels has to be careful not to exclude people or groups of people just because it suits them best. This issue too would be addressed during an NTA 8080 audit.

Phytofuels engaging with village people

2.2.3 Non-conformity risk regarding community gifts

Another issue that incorporates the danger of becoming borderline or even a non-conformity is the use of investments and gifts, such as the street lighting in some villages and Christmas gifts to children in the area. Where the street lights can be classified as development of the local community, still both have a slight scent of bribery about them. At present they would not be classified as bribery, but again, Phytofuels has to be very careful not to cross the line here. People need to have the ability to give their free and honest opinion about the project. All Phytofuels' endeavours should be aimed at ensuring that.

2.2.4 Registration of stakeholders and complaints

Phytofuels would be advised to register all stakeholders they have contacted. During an audit this will be required. They also have to make sure they have a register of all (formal) complaints that were made against the project. Such a register may contain a lot of entries coming from political objections against the project rather than substantial objections. Phytofuels may classify such entries as political and therefore not for them to solve, but they must identify these complaints. If not for anything else, then at least to make sure that all complaints are registered and substantial complaints are not simply and unjustly discarded as political. Absence of a register would lead to a non-conformity in an NTA 8080 audit. It has not become clear whether such a register exists.

2.3 Greenhouse gas balance

2.3.1 Report summary

The greenhouse gas balance is an important pillar of biomass chain sustainability assessment, with measurable indicators and clear boundaries for NTA 8080 compliance. In line with NTA 8080, biomass operations should result in GHG savings of at least 70% when compared to current use of fossil fuels. As explained in Poppens *et al* (2013b), all three biomass chains are compliant with this requirement. For a better grounding of this result, hereafter some additional issues are addressed, regarding the used methodology, harvesting on peat land, biomass drying and reed burning.

2.3.2 Choice of methodology

For the methodology of the GHG calculations, no use could be made of existing tools such as developed in the Biograce project or by Senternovem. Both tools do not include reed, switchgrass or straw as feedstocks. And both tools are not sufficiently transparent to have full control over all variables that should be used in a calculation from scratch. It was therefore decided by the project to produce its own calculations. These calculations are fully based on the methodology as explained in Annex V “Rules for calculating the greenhouse gas impact of biofuels, bioliquids and their fossil fuel comparators” of the Renewable Energy Directive. That methodology did well serve the purpose of the project and resulted in correct figures for all three supply chains. Attempts were made to verify these calculations against the calculation tool used by the Green Gold Label certification scheme for solid biomass for energy application. This fell through, however, as both calculations used different units (e.g. amounts per ha vs. amounts per hour) and it was not entirely clear whether the information provided was sufficient for the Green Gold Label tool, leaving too much uncertainty about the outcomes. It should be noted, however, that also in the Green Gold Label tool the 70% threshold defined by NTA 8080 (Table 3) was never breached.

2.3.3 Harvesting on peat lands

Reed lands in the project area can be found on both mineral soils and peatland. One of the main reasons to prohibit the use of peatlands both in the 2009/28/EC Renewable Energy Directive (Article 17.5) and the NTA 8080 (Article 5.2.2) is that exploitation of these areas will result in large CO_2 emissions. This is especially the case when draining of the area takes place. These emissions

will amount to such levels, that it becomes impossible to regain these losses by means of the new management. The RED provides the exception where "evidence is provided that the cultivation and harvesting of that raw material does not involve drainage of previously undrained soil". NTA 8080 does not state this explicitly, but since it should take the RED into account in full, it is fair to assume that this exception is acceptable to NTA 8080 as well. This means that exploitation of peatlands should be acceptable as long as management and operation procedures are such as to avoid drainage and excessive emissions of soil CO_2.
This project intends to comply with this requirement, since proposed harvesting methods will not have negative influence on water levels. Also, harvesting will take place in winter, when the ground is solid or ice is thick and no soil disturbance nor CO_2 release is expected to occur. Though water level regulations may be considered in the future, in order to control reed yields or quality, drainage of the reed land should be avoided at all times.

2.3.4 Biomass drying not included in the GHG calculations

In the executed calculations, biomass use for drying purposes was not incorporated. It is of importance to realize that, in case fossil fuels are used for heating, drying will have a huge impact on the outcome of the calculation. In the project there was a 9% moisture content difference between harvested material and the preferred moisture content at pelletizing. Per ton of biomass, an additional 10 kWh of energy would be required to make up for one percent of moisture. To reduce moisture by 9%, this would mean an extra energy input of 90 kWh, resulting in 66% of emission savings which is below the 70% threshold laid down in NTA 8080.

2.3.5 Avoidance of reed burning

It is assumed in the calculations that harvesting reed will replace current reed burning practices. As a result a (small) surplus GHG efficiency is achieved. Question remains however if this will actually be the case. Do hunters indeed stay away from burning practices if they find that their preferred hunting spot is not to their liking? And where burning is a result of burning of waste in peoples' backyards, will this be avoided in the future? Reed operation managers should address this matter both in contracts with local communities and in their procedures, so their management practices and its impact on the region are not compromised. Nevertheless, it is very unlikely that the 70% emission savings will be jeopardized.

2.4 Competition with food and local biomass uses

According to NTA 8080 (provision 5.3), "the production of biomass for energy shall not endanger the food supply and local biomass applications (energy supply, medicines, building materials)".
The project has focused on indirect land use changes (ILUC). As elaborated in the report by Poppens *et al* (2013b), ILUC is mainly a macro-economic topic and very hard to translate into requirements that can be effectively verified on a micro-economic scale. A lot of work is currently put into the development of such requirements, but until verifiable requirements are accepted, NTA 8080 will have to restrict itself to current provisions. These current requirements only relate to providing data on this topic if requested by governments and regulatory bodies.

Several approaches were taken by the project to tackle the ILUC problem. One way is by using agricultural by-products such as straw, in which case there are no additional land claims. However, as pointed out in Poppens *et al.* 2013b, there are important obstacles when using straw. Its current

uses in the project region and importance for maintaining soil fertility mean that extra harvest for biomass purposes could also increase ILUC risks.

Of all three biomass feedstocks, reed is considered to have the best ILUC profile. It grows naturally in wetland areas that are not used for agricultural production. Here too, no extra agricultural land needs to be taken into production and thus ILUC effects may be considered limited. Moreover, there are no large-scaled uses of reed at present and potential future uses for thatching would only apply for a minor part of available reed lands due to quality limitations.

The biggest ILUC challenge of this project is switchgrass cultivation. Future growers of switchgrass and similar energy crops may seek good agricultural soils for its production, hence the imminent danger of causing ILUC effects. Here, a novel approach was taken by the project. Switchgrass cultivation experiments were carried out on two types of land, on fertile and less fertile soil. The comparison in yield sheds light on the extra cost per ton of biomass required to minimize ILUC, if cultivation takes place on less fertile soils. Two types of costs are taken into account here – the economic costs related to lower yields and/or higher input needs and the extra greenhouse gas emissions per ton of produced biomass. The conclusion is that ILUC can be minimized by growing switchgrass when cultivated on less productive or abandoned land, but this comes at an expense, in the form of higher cultivation costs and a less favourable – though potentially still positive – GHG balance (section 2.3).

2.5 Biodiversity

The NTA 8080 states the following regarding biodiversity: "biomass production does not affect protected or vulnerable biodiversity and will, where possible, strengthen biodiversity". This includes multiple aspects of biodiversity that were translated into several criteria. For more information we refer to Sluis *et al.* 2013.
Three key issues were identified (Hennenberg et al. 2010), to be addressed in any biodiversity risk-mitigation strategy:

- Conservation of areas of significant biodiversity value;
- Mitigation of negative effects related to indirect land-use change;
- Promotion of agricultural practices with few negative impacts on biodiversity).

To address these key issues, the project consulted the following sources: published literature on (the impact of) wetland management), expert opinions and agreed guidelines for wetland management – which are usually also based on 'expert opinion'.

These activities have resulted in recommendations for best practices that should guarantee protection and possibly improvement of biodiversity of reed harvesting operations. Details can be found in the project report (Sluis *et al*, 2013).
Section 2.1.3 of the present report mentioned already includes a critical remark about production in the vicinity of protected areas. And the project partners expect to touch upon more such critical issues once biomass operations have really taken off. It is important to realize that biodiversity protection depends on collective action among stakeholders, including in areas adjacent to the production site that are often not under the control of the site manager. It is of utmost importance that local, regional and national government bodies get involved in developing sound and structural legislative frameworks for biomass operators to work in.

2.6 Environment

2.6.1 Soil Organic Content modelling for straw harvesting

Regarding the provisions about the Environment, emphasis was placed on soil quality issues regarding the straw chain. For straw harvesting, an important aspect to take into account is the preservation and improvement of the soil quality (provision 5.5.1.2). Especially the maintenance of soil organic matter is relevant for the straw chain. Also the nutrient balance should be maintained, but nutrients are often replenished by mineral fertilizer, while the input of soil organic matter is often only from the crop residues, as in Ukraine few animal manure and compost is used for cereals. When straw is removed for bioenergy there is a risk of decline in soil organic matter.

As described in Poppens *et al*. 2013b, model simulations were carried out to predict effects of different straw management options on soil organic carbon stocks. In addition, calculations were performed about the amount of straw that can be safely harvested without depleting soil organic matter.

Results show that under the current conditions, straw harvesting is not feasible without decreasing the soil carbon content in the project region. When these soils are used for agriculture it is very difficult to maintain the SOC level. Therefore, without drastic management changes (e.g. increasing manure, fertilizer, improved seeds), straw harvesting will lead to incompliance with provision 5.5.1.2 of NTA 8080 and is thus not recommended.

2.6.2 Other Environmental aspects concerning reed harvesting

Other aspects of Environment are covered in Sluis *et al*, 2013. Regarding the removal of nutrients, this is not considered a big risk by the project. Nutrients removal is not very high in reed lands compared to agricultural lands and on flooded soils one can expect that these amounts are compensated by sedimentation. On the other hand, reed harvested annually on non-flooded soils may carry a risk of nutrient depletion. But in that case the reed system should be considered as agricultural system, with related fertilization requirements to prevent reed yield decline.

Also the risk of declining soil organic matter is limited in reed fields, as reed is a perennial plant of which at least the roots and stubbles remain in the soil. Late harvesting in winter is in this case beneficial for soil organic matter, as the leaf biomass will remain on the field. Natural reed systems often have a high build-up of soil organic matter, which in case of high (ground) water levels results in the formation of peat soils. This process can be disturbed by the harvesting of reed, but we do not expect this to result in a negative soil carbon balance because of the perennial rooting system. However, there is no data to support this statement, as this would require long term soil sampling or modelling of the carbon flows. A variety of soil organic carbon models exists, but these are mainly aimed at agricultural systems and have, as far as we know, not been parameterised or applied for reed.

Many of the reed land in Ukraine are found in wetlands (see Chapter 3). Most of these wetlands are also peatlands with Histosols (organic soils). These peat soils have a very low bulk density and therefore a low carrying capacity. This is of importance for the reed harvesting. With heavy machinery there is a high risk of destroying peat soils, with subsequent high levels of CO_2 and N_2O emissions. Therefore machines should have low pressure tyres to reduce the impact on the soil or

harvesting should occur during periods when the soil is frozen and stable enough to support heavy machinery.

Regarding impact on ground and surface water (provision 5.5.2), reed harvesting should have no negative effects. Reed is grown naturally without use of fertilizers nor pesticides or other agro-chemicals, with the risk of leaching to ground and surface water. Furthermore irrigation and water extraction is not occurring in these reed systems. The only risk may be some pollution during the harvesting, e.g. oil leakage. With reliable machinery this risk should be minimized.

The risk on air pollution (5.5.3) is also low in the reed chain, as no use is made of any chemicals. The main risk is the emission of particulate matter during the pelletizing. Although this process produces quite some dust, most of this probably consists of larger particles and not the harmful fine particles (e.g. PM2.5). A recommendation is the use of dust caps by the workers and to prevent dust emissions outside the pelletizer unit. A big help in reducing air pollution is offered by the project, in providing an alternative to current reed burning practices. Obviously this has also positive effects on the GHG balance (section 2.3 of present report).

2.7 Prosperity

Just like the provisions for social well-being, the sustainability requirements grouped under *Prosperity* were not included in the project due to lack of data from current biomass operations. An exception was made for the generation of employment of biomass production and its comparison with fossil-based energy types and other non-fossil alternatives. This analysis is documented in Chapter 11 of Sluis *et al*, 2013.

World Bank figures show that biomass operations may generate around 60 full time jobs (fte's) for each Peta Joule (10^{15} Joule) of generated energy. This is roughly the double amount when compared with coal and natural gas. Job creation for several other non-fossil alternatives is even better however, such as for geothermal energy and landfill gas (69 and 199 respectively).
Other World Bank data show the number of jobs generated for different energy technologies, per million US dollars of spending. In a comparison between different available energy technologies, biomass seemed to generate most jobs per million US dollar of spending, i.e. 17.4, even more than wind (13.3) and solar energy (13.7). It is pointed out however, that real figures are much dependent on the used technologies and other variables in actual cases.

3 Experiences with NTA 8080 in Ukraine

3.1 Introduction

After discussing project compliance with NTA 8080 in chapter 2, in this chapter the NTA 8080 itself is assessed for effectiveness as sustainability tool applied in Ukraine. Also, the future for this standard and overall future for biomass sustainability in Ukraine is discussed. In subsequent sections hereafter, encountered obstacles for effective standard implementation are covered followed by a discussion on the future for sustainable biomass and recommendations for improved sustainability.

3.2 Encountered obstacles for NTA 8080 implementation

3.2.1 Legislation and enforcement

The NTA 8080 standard was developed in the Netherlands and perhaps not surprisingly, compliance is relatively easy to achieve for organizations who have successfully applied for licenses and permits under Dutch Law. This is due to the stringent environmental permit that organizations must apply for in the Netherlands, covering almost all NTA 8080 provisions and more.
The context of Ukraine is however very different. Studies revealed that reed as biomass resource is poorly covered in national legislation and clear procedures for harvesting licenses were absent. Legislation and (use) rights of reed are partially based on custom law, making it difficult to obtain a clear view and an unambiguous description of rights. Project partner Phytofuels Investments had to develop its own methodology to acquire harvesting permits, engaging with multiple authorities and local communities – the legal owners of reed resources. With success, as by September 2012 they had succeeded in obtaining harvesting licences for over 9000 hectares of reed. This process of acquiring harvesting permits as experienced by Phytofuels is described in detail in Poppens *et al*, 2013a.

With legislation as ambiguous as it is, it comes as no surprise that governments and law enforcers are often unaware of relevant legislation and permit procedures. And even if they are, it is custom in Ukraine to organize permits with responsible authorities through bribes.

Reed land in Ukraine: unclear juridical status

This situation obliged Phytofuels to bypass certain stakeholders on different levels of governance, bringing them into conflict with NTA 8080. Because, although bribing is unacceptable, it is also not allowed to exclude important stakeholders. It is clear that interpretation by NTA 8080 is needed.

Another, related, issue is the use of certain concepts in NTA 8080 that do not match Ukrainian reality. One example is the concept of smallholders, who are exempted from most of the standard provisions (except GHG balance and soil impact). Smallholders do not exist in Ukraine. Farms that are considered small in Ukraine, may still own a hundred hectares or more. Here too, more specific interpretation of the NTA 8080 is required.

3.2.2 Unreliable and insufficient data available for verification

It is difficult to get reliable data in Ukraine, that would be required for verification of NTA 8080 compliance. Good topographical maps are usually not available and even protected areas do not have registered GPS coordinates. Only in one village, a self-made improvised map was available with rough outlines of land use types on a scale of 1:500. However, this map was from 1960 (!) and much land use changes had occurred in the meantime. The total reed area was about 1200 hectares based on that map, whereas 650 hectares was officially registered as protected area (*Zapovednic)*. There was no indication of the border between the protected and unprotected reed land. An additional verification problem emerged when considering that from 1960 on, the total reed area had increased to approximately 1500 hectares. Yet, the additional 300 hectares could not be verified due to lack of official documentation and maps.
Also no clear Cadastre documents were encountered, village boundaries were found to be unclear and statistics proved unavailable or unreliable. It seems almost impossible to justify and verify important certification issues such as ownership, land use, land borders and boundaries of protected areas. This would of course be problematic for verification in an official certification audit.

3.2.3 No market for certified biomass

The lack of markets for certified biomass is an obstacle different from the standard implementation obstacles mentioned above. At the time of this report, few viable EU markets for Ukrainian biomass were identified. This means also that there are no Ukrainian companies currently willing to have their operations certified in accordance with NTA 8080. We refer to Poppens *et al* (2013b) and Jamblinne *et al* (2013) for more information regarding the market for herbaceous biomass. There is a good market for domestic heating applications, but it is unlikely that strict NTA 8080 requirements will be applied for the domestic market for there are no regulations nor incentives that would benefit certified producers.

For Ukraine in general, sustainability is not very high on the consumers agenda and therefore also not on the companies' and governmental agendas. The country has more pressing issues to tackle. There is some interest in food safety certification, but not much more than that. In general this also means that support from the community in general and pressure from specific local consumers, clients and governments will be minimal.
During the project multiple events for NTA 8080 promotion were organized by project partner Phytofuels Investments and the Institute of Biomass and Sustainable Development (Poppens et al, 2013a). But stimulus from Western European markets is needed to get sustainability certification on track in Ukraine.

3.3 Recommendations for improved standard content and implementation

In previous sections we have summed up a number of obstacles for implementation of the NTA 8080 standard in Ukraine. Lessons should be drawn for national organizations as well as for standard owners, developers and Certification Bodies, to make NTA 8080 (and any other sustainability standard for that matter) more practical for the Ukrainian context.

Active interaction should be promoted, between companies and legislators on all levels. This may help ensure that sustainability criteria are carried out and enforced. This also requires changes and additions to national legislation, especially regarding the use of reed, other natural resources and agricultural by-products. Also reliable information such as maps and cadastre documents should become available, for more transparency and verifiability.

Standard owners (NEN in the case of NTA 8080), standard developers and Certification Bodies should be aware that each country (and in some cases regions) should be assessed on its own merit. And clauses and requirements in standards should be worded such, that interpretation allows for specific circumstances. At the same time, one needs to avoid a situation where participants start screaming blue murder because they feel disadvantaged as a result of differences of interpretation. Using a national (Ukrainian) application of NTA 8080 or even incorporating NTA 8080 in national legislation will tailor requirements to the specific Ukrainian circumstances. Complying with such requirements should therefore be easier. It should also prevent enforcement of requirements that do not really have added value in this specific country. There is however also a disadvantage. It is always a challenge to keep a specific national standard in line with developments of the main standard. This requires specific maintenance of the national standard, or else a decision should be made to make it an independent standard. Another issue would come up if NTA 8080 were taken up in national legislation. Certification cannot be done in accordance with legislation, so incorporating the standard in legislation requires a separate standard to be drawn up, in order to verify compliance.

Another option altogether would be to gather all important stakeholders in Ukraine and have them formulate their own national standard for biomass sustainability. Here it is important to have all relevant stakeholder on board, for maximum acceptance both domestically and internationally and for minimal problems later on.

4 Conclusions and Recommendations

4.1 The future of sustainable biomass from Ukraine

The project results show there may be a future for sustainable biomass in Ukraine. The GHG balance requirements for biomass to energy applications seem within reach. Also biodiversity and environmental integrity can be maintained or even improved if best practices for reed management are implemented. And regarding indirect effects, analyses show a potentially good future for Ukrainian biomass with minimal ILUC risk.

Some non-compliance risks were discussed concerning the project approach to legislation and stakeholder consultations. Phytofuels is, understandably, very much concerned with expanding their business and anything directly concerned with that. But in the process they are in danger of overlooking issues that may seem to be not all that important, but that may end up to become a non-conformity in an NTA 8080 audit. Legislative matters that do not seem to be very relevant at the moment must not be forgotten. And people that are opposed to the project cannot simply be discarded in the stakeholder consultation. And yes, the project is currently at a stage where legislation on labour conditions are not yet of interest. But legislation on water quality for instance, may be. It is important to keep track of all rules and regulations that apply and to make sure these are implemented in time, even if they do not seem to be that beneficial to the business.
In dealing with legal requirements and stakeholders, the main obstacles that biomass producers will face in the Ukraine are threefold: Lack of legislation or its interpretation; a culture of bribery and a culture where power-balances within communities are of importance. In such an environment it is crucial to uphold one's integrity and to avoid the pitfalls of old habits, attitudes and customs. Phytofuels is also making clear that it is one's own choice either to follow long-standing bureaucracy or to try and make a difference and to participate in initiatives to change legislations.

4.2 Recommendations for improved sustainability of biomass in Ukraine

These are important lessons learned for Phytofuels Investments and other future biomass companies. But, the responsibilities for sustainability of biomass must be shared with key national stakeholders. Governments and legislators must improve current legislative frameworks for biomass and ensure transparent and honest enforcement. Only when a level playing field is achieved, benefitting those companies who abide by these standards and sanctioning those who don't, will biomass lead to overall sustainability with benefits for people, climate and the environment.
If international standards such as NTA 8080 have any role to play in achieving sustainability of biomass operations in Ukraine, they must bear the spirit of the context in which they are applied. Standard developers as well as Certification Bodies should use terminology and verification methods that make sense in the country of application so that sustainability requirements can be practically enforced.

References

Lesschen, J.P.; Elbersen, H.W.; Poppens, R.P.; Galytska, M; Kylik, M; Lerminiaux, L (2012). The Financial and GHG Cost of Avoiding ILUC in Biomass Sourcing – A comparison between Switchgrass produced with and without ILUC in Ukraine. Wageningen UR (Alterra, Food & Biobased Research), Poltava State Agrarian Academy, Phytofuels Investments.

NEN (2009). *Netherlands Technical Agreement (NTA 8080),* Sustainability criteria for biomass for energy purposes.

NEN (2010). *Netherlands Technical Agreement (NTA 8081:2010) informative copy*. Certification scheme for sustainably produced biomass for energy purposes.

NEN (2010). *Netherlands Technical Agreement Interpretation document 02 linked to NTA 8081.*

Poppens R, Kraisvitnii P, Rii O (2013a) Taking the Law to the People – mobilizing community ownership for legal reed harvesting in Ukraine. Experiences with Ukrainian legislation and stakeholder consultations for commercial reed harvesting in rural communities. Pellets for Power project. Wageningen UR Food & Biobased Research Wageningen.

Poppens R, Lesschen JP, Galytskaia M, Kraisvitnii P, Rii O, Elbersen HE (2013b) Herbaceous biomass supply chains. Assessing the greenhouse gas balance, economics and ILUC effects of Ukrainian biomass for domestic and Dutch energy markets. . Food and Biobased Research, Wageningen, The Netherlands,

Poppens, R (2012) Biobased Economy Info Sheet. *Duurzaamheid van Biomassa*. Online publication By Wageningen UR Food & Biobased Research.

Poppens, R (2012) Biobased Economy Info Sheet. *Duurzame biomassa uit Oekraïne*. Online Publication by Wageningen UR Food & Biobased Research.

Poppens, R (2011). NTA 8080 Analysis of the JaLo pellet chain. An integrated framework to assess spatial and related implications of biomass delivery chains. Climate Change Spatial Planning Program. Wageningen UR Food & Biobased Research.

Sluis, T van der, Poppens R, Kraisvitnii P, Rii O, Lesschen J.P., Galytska M. Reed Harvesting from Wetlands for Bioenergy. Sustainability and economic viability of reed harvesting in Ukraine. Pellets for Power project. Wageningen UR Alterra.

http://www.agentschapnl.nl/programmas-regelingen/sustainable-biomass-import