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WB 1 - NTA 8080 analysis of the JaLo pellet chain

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Content

Introduction

This report was produced in the framework of project “ME4 - Klimaat voor Ruimte en Ruimte voor Klimaat”. Project ME4 aims to contribute to enhanced bioenergy production in the Netherlands, by studying the potential for improvements in bioenergy production chains.

Perspectives and impacts of bioenergy production in the Netherlands were analysed, by means of two practical cases. One case features a company based in the Twente region of the Netherlands, “JaLo Biopellets Twente”. JaLo intends to harvest biomass from landscape elements and turn that into pellets for energy purposes. The sustainability of these future operations was assessed through a specially developed sustainability framework consisting of several tools.

This NTA 8080 study takes the JaLo chain sustainability assessment one step further. It tests the chain set-up for compliance with a series of formal sustainability requirements, as documented in the Dutch 8080 standard. In addition, the project framework tools are validated against this standard; it is analysed to what extend they cover each of the NTA 8080 sustainability requirements.

It is hoped that the NTA 8080 analysis results can shed light on the potential for biomass-to-energy production in the Netherlands. When sustainability of biomass production can be demonstrated, landscape elements throughout the Netherlands may regain their importance for rural economies. This may provide an important mechanism for long-term protection of valuable landscapes, and at the same time contribute to fighting global climate change.

An additional objective of this study is to test the application of the NTA 8080 in the Netherlands. Some of its sustainability requirements seem more suited to conditions in biomass producing areas in less developed countries. This study should reveal to what extent these requirements are practical, relevant and implementable in the Dutch context.
Results should also provide JaLo Biopellets Twente with a first assessments of its potential for (future) certification against NTA 8080. Other current and future biomass based organizations may benefit from the analysis too.

The report has 10 chapters. The first two chapters describe the NTA 8080 standard and the general JaLo pellet chain set-up, respectively. The following seven chapters each cover one NTA 8080 sustainability component. Chapter 10 discusses the analysis results and provides recommendations for ME4 project partners and people and organizations working on bio-energy standards and sustainability tools. The annex includes a flow-chart of the studied landscape biomass-to-energy chain.

1 NTA 8080 sustainability standard

1.1 NTA 8080 and NTA 8081: tools that demonstrate sustainability

The European Commission and the Netherlands have set ambitious targets for making their energy production more sustainable. Large-scale use of biomass is considered essential for achieving this objective.

A condition for the application of biomass for energy purposes, is that biomass producers can *demonstrate* sustainability. On both European level and in different 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 wellbeing. 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 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, as Tjipke Hoekstra from Control Union Certifications explains. That is why certificates may 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 NTA8081.

1.2 Who is to be NTA 8080 certified and why?

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 conform to 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.

1.3 Sustainability categories in the NTA 8080

In principle, organizations that seek NTA 8080 certification would need to comply with all sustainability requirements listed in that standard. Conditions for partial exemption are discussed under 1.4. Organizations that qualify for these exemptions must only 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, respectively.

The sustainability requirements are grouped as follows, with the provisions for exempted organizations underlined:

NTA 8080 Sustainability requirements

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

- Competition with food and other local applications
- Biodiversity
- Environment
    - Soil
    - Water
    - Air
- Prosperity
- Social wellbeing

1.4 NTA 8080 ambiguity: does JaLo qualify for partial exemption?

Partial exemption is granted to organizations that use biomass labeled as "residual flows representing an economic value that is less than 10% of the main product".
Annex A of the NTA 8080 lists biomass materials that are defined accordingly. For biomass materials not listed here, "sufficient evidence shall be submitted that this biomass is nevertheless accepted as an exception. Reliable information about prices of residual flows and main products shall be submitted as sufficient evidence among other things"

However, it is not entirely clear whether JaLo's biomass sources qualify for exemption. Although the fresh wood harvested from hedgerows should fit the category of "remaining fresh wood" in Annex A, the difficulty is with defining of the "main product" and the economic value referred to in the definition above. The same applies for hay and grass, as by-products from managed nutrient-poor meadows. According to Tjipke Hoekstra from Control Union Certifications, this issue is still under discussion within the Committee of Experts responsible for drafting the NTA 8080 and 8081. He thinks that the requirements regarding "main product" and economic value may not apply, in case by-products serve the larger purpose of landscape management. And this is the case for all three biomass materials used by JaLo Biopellets Twente.

Although "hay" and "grass" from managed nutrient-poor meadows are not listed in Annex A, Hoekstra believes that there could be grounds for a discussion to fit them in the category of "grass from roadsides", on the basis that roadsides in the Netherlands are often managed like nutrient-poor meadows. He also provides an explanation for the absence of "hay" in this list of residues. By listing it, it would appear to include hay derived from productive meadows, as main product, rather than as residue.

A complicating factor for admitting both wood from landscape management and hay and grass from nutrient poor meadows is that these products may clash with requirements in Article 17 of the Renewable Energy Directive (2008). Here it is stated that biomass may not originate from "wooded land, namely forest and other wooded land of native species, where there is no clearly visible indication of human activity and the ecological processes are not significantly disturbed" (3a). The same limitation may apply for areas that appear to be classified as "non-natural grassland that would cease to be grassland in the absence of human intervention and which is species-rich and not degraded" (3c). In both cases, evidence has to be provided that the harvesting of the raw material is necessary to preserve its landscape status.

Proving that the industrial wood chips used in the first phase of operations (chapter 2) are residues, should be more straightforward. The category of "wood from processing" seems to fit best this type of residue. Besides, there is a clear "main product" from which this by-product is derived and also the economic value argument is met.

Hoekstra, who himself has participated in drafting the NTA 8080 standard, acknowledges that the NTA 8080 needs further precision in formulation of the criteria and terminology used. Current and

future biomass based projects are called upon to contribute with data for further refinement of the standard. A specially designated work group – the interpretation committee – picks up on inconsistencies with practice and continues updating of the NTA 8080. In that sense, the NTA 8080 is still work-in-progress, rather than a fixed "blue-print" for biomass operations.

For practical reasons, in the following chapters it is assumed that no partial exemption applies to JaLo. This means the company must comply with all sustainability criteria described in the NTA 8080.

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2 JaLo pellet chain

2.1 NTA 8080 analysis for Situation I/II

The Twente region is well-known for its beautiful and historic landscape elements, such as hedgerows, nutrient-poor meadows and heath lands. These areas are of significant cultural and biological value and their existence is dependent on regular harvesting operations. It is from these areas that JaLo intends to obtain its biomass, for the production of "biopellets" for energy purposes.

These areas are, however, dispersed and managed by a variety of organizations. Up to now, few contracts with potential biomass suppliers have been secured. Therefore, in the start-up situation, JaLo will use predominantly wood residues from industries in the region. We refer to Meesters *et al* (2008) for details regarding origin, quality and quantities of these residues. This industrial fraction is then gradually replaced by wood residues and mowings from landscape elements. After 12 years, this transitions should have been fully realized. This period of twelve years coincides with the used coppice harvesting cycle, and the time needed to transform former timber-mine woodlands (*mijnhoutbossen*) into biomass sources that produce up to 40 percent of JaLo's needs.

This transition has significant implications for sustainability, as it comes with e.g. changing transport movements and increased upstream-operations. That is why the greenhouse gas emission calculations have been performed for two situations. Situation I coincides with the use of industrial residues at the start-up of JaLo operations. Situation II starts after the first 12 years, when the transition to full use of natural biomass has been completed.

2.2 Antecedents of JaLo Biopellets Twente

JaLo Biopellets Twente is a private company situated in the Twente region of the Netherlands. The company name is an acronym, derived from the first names of the company's two founders and owners, Jan Demmer and Louis Welhuis. The JaLo company finds its origin in the experiences with landscape maintenance of company *Landschapsadvies and onderhoudsbedrijf Welhuis BV* and builds upon its experiences with the production of grass pellets in Denmark. Those initial experiences have enabled the company to fine-tune its production set-up. Twente is particularly suitable for production of natural biomass. The region has abundant hedgerows and other landscape elements, that require periodic harvesting to maintain their productivity and survival. JaLo will use a harvesting system that meets the dual objective of economic benefits and conservation.

By April 2011, JaLo hopes to complete the permit procedures and start building a pellet plant in the city of Almelo. Part of the pellets will be co-fired in electricity plants, replacing coal. For the remainder of pellets, sales outlets are sought in the direct surroundings of Almelo. Potential buyers include swimming pools, old people's homes and other sites where decentralized heating and power installations are operated, traditionally running on natural gas. By replacing coal and gas with biomass pellets, JaLo intends to capitalize on national and international demands for lower emissions of greenhouse gases. JaLo expects to acquire at least 180.000 tons of biomass on a yearly basis. Potentially, this amount may increase to 240.000 tons per year.

2.3 General chain description

The Annex provides an overview of the JaLo pellet chain, with indication of all main biomass based operations and input and output flows. For the purpose of assessing the greenhouse gas balance in chapter 4, only fuel and electricity flows (input) and greenhouse gas flows are included. Hereafter, a description is provided of all operations, on three levels of the pellet chain.

Upstream: Biomass origin, extraction and transport

JaLo obtains a mix of biomass types, from a variety of landscape areas. This includes biomass from hedgerows, heath lands, nutrient-poor meadows, former mine-timber woodlands (mijnhoutbossen) and other areas. As the seasons go by, the available biomass varies considerably in type and available quantities.
Roughly, a distinction is made between wood from hedgerows and woodlands and mowings from areas under a regime of soil impoverishment (for conservation purposes). Wood types include oak, beech, ash and softwoods such as willow and popular. Harvesting in winter is preferred, as leaves would result in higher ash contents. Mowings include a mixture of grasses, herbs, small trees, saplings, heath and other biomass materials.

Landschapsadvies en Onderhoudsbedrijf Welhuis BV employs specialized equipment for wood harvesting. A type of caterpillar-crane is used, equipped with a hydraulic cutter. The wood is processed in a chipper and the chips are loaded directly into a container, for transport to the pellet plant.
The mowings are harvested with a swather, and then baled. The bales are loaded on a truck for transport to the pellet plant in Almelo. Sometime in the future, JaLo intends to bundle the mowings and leave the bundles drying in the field. This process should result in savings on transport and drying further in the chain.
At the start-up of JaLo operations (Situation I), this fraction of natural biomass is very small. Almost all biomass is acquired from wood-based industries, in the form of chips or shreds.

Both the natural biomass and the industrial residues are transported by truck to the pellet plant in Almelo. JaLo has a half-open storage space, with a maximum storage capacity of 6000 cubic meters.
Details regarding transport movements, costs and fuel used are described in Meesters *et al* (2008).

Biomass processing

Prior to processing, the biomass has a moisture content of approximately 50 percent. The half-open storage facility enables a first natural drying process. Loading and unloading of biomass is performed with a wheel loader.

In the first processing step, the biomass chips and shreds are reduced in size. The chips are subjected to hammer mills with a capacity of 30 tons per hour and the particles are reduced to a maximum size of three millimetres. In the same process, sand, clay and gravel is removed. The hammer mills are state-of-art technology, producing less noise. Instead of beating, they subject the chips to a grinding process.

The biomass is then dried with hot air from a biomass-fed 12 Megawatt oven. This process costs approximately 10 percent of the initial amount of biomass. The burning process is very clean, resulting in very small amounts of ash. Afterwards, the biomass is stored and has a moisture content of approximately 10 percent.

In the third process step, the biomass is fed into pellet producing presses. The pellets have a moisture content of 8 percent and are air-cooled before being stored in a silo. Special filters are applied as well as fire-protection and other equipment to optimize safety.

Downstream: Biomass distribution and application

There are two possible destinations for the biopellets. In large-scale electricity plants, the pellets will be co-fired with a mix of fossil fuels (so-called Dutch production mix). JaLo prefers the second option, which are decentralized installations that produce heat for e.g. swimming pools and old people's homes. Contracts with the latter type of clients would enable JaLo to sell its pellets in the direct surroundings of the pellet plant, from where the biomass is supplied. This would save on transport costs and emissions, given that biomass supplying trucks could return with a load of pellets. By December 2010, it was not clear where the (larger part of) pellet produce would go to. After consultation with Tjipke Hoekstra from Control Union Certifications, it was decided to perform

3 Documentation, legal frameworks and stakeholder consultations

3.1 Explanation

Three general sustainability aspects are grouped in the NTA 8080 standard under section “General”. These include requirements regarding 1) documentation, 2) conformity with international, national and regional laws, regulations and signed agreements, and 3) consultation of stakeholders. The requirements are listed in sections 5.1.1, 5.1.2 and 5.1.3 respectively, of the NTA 8080 standard. Whether or not an organization uses residual flows listed in Annex A, all organizations must comply with these three general requirements.

3.2 JaLo NTA 8080 compliance

3.2.1 Documentation

The requirements for documentation include measures for keeping records, reports and notes, as evidence for measures, procedures and operations undertaken by the organization. For NTA 8080 certification, these documents must be prepared and made available to third parties (i.e. Certification Bodies), as evidence of conformity with the NTA 8080 requirements.
Often, biomass businesses face additional documentation needs, conform regulations applying on national level. Compliance with national laws is a NTA 8080 requirement by itself, discussed in 3.2.2.

Compliance shall be verified by a Certification Body if JaLo decides to certify its operations (chapter 1).

3.2.2 National legal frameworks vs. NTA 8080

Conform NTA 8080, organizations must abide by all applicable national and regional laws and regulations, as well as any international agreements and treaties signed by the country of establishment. According to Tjipke Hoekstra (2010) of Control Union Certifications, in the Netherlands, much of the NTA 8080 standard is covered by national laws and regulations. In practice this means that when organizations have successfully applied for licences and permits under Dutch Law, they effectively comply with many of the NTA 8080 sustainability requirements. This is based on the assumption that governments are fulfilling their duties, by ensuring any permits are rightfully and adequately implemented.

Sometimes the NTA 8080 requirements are stricter or more comprehensive than those demanded by national laws. In such cases, would-be certificate holders must still abide by the NTA 8080 requirements. According to Hoekstra (2010), complications sometimes occur when companies have multiple business units or operate on multiple locations. In that case, NTA 8080 compliance must stretch as far as the company’s operations go, to the extent that compliance can be practically assessed by the auditor.

Here too, compliance shall be verified by a Certification Body if JaLo decides to certify its operations (chapter 1).

3.2.3 Biomass with waste status

The legal status of biomass in the Netherlands, conform *Wet Algemene Bepalingen Omgevingsrecht* (WABO), may be a potential obstacle for biomass based business development.

On a website supported by the Dutch Ministry of Agriculture (www.natuurbeheer.nu), "waste" is defined as anything other than deliberately produced and not intended for disposal. Though this definition of waste appears to exclude biomass materials used by JaLo, the ambiguity starts with an example of wood. Apparently, wood used for selling is not labelled waste, whereas its by-products such as tops and branches, are. Also a list of examples of waste is provided, including pruning wood and mowings. Producers of such "waste" face high costs for removal and disposal on composting sites for example.

Under certain circumstances, applicants of the Environmental permit can be exempted from mandatory disposal. Besides, the *National Waste Management Plan* encourages activities that give use to waste products. It is not clear, however, whether processing into energy pellets would qualify for disposal exemption.

Such ambiguities do not help companies in legal compliance. It took JaLo two and a half years to obtain the environmental permit. One of the obstacles was that there was no legal code for "landscape wood"; this particular type of biomass material simply did not exist in legal terms.

3.2.4 Dutch laws and regulations

As of October 1st 2010, the Law *Wet Algemene Bepalingen Omgevingsrecht* (WABO) has been in force, regulating the *omgevingsvergunning*. This permit integrates various permits previously in place, including the *mileuvergunning* en *bouwvergunning*. By December 2010, JaLo has obtained the *milieuvergunning* and has started the procedures for the building permit (bouwvergunning). This new law was introduced supposedly to simplify procedures for applicants.

Under this law, JaLo's biomass materials should be on the "white list" (Category Forest-based), of clean materials. Part of the procedures is drafting a special document (AV-AO/IC), describing requirements for receipt, processing, registration and control of waste materials.
Other laws and procedures covered in this permit include *Kader Wet luchtkwaliteit, Kader geurbeleid* and *Wet geluidshinder,* further described in chapters 7 and 9.

JaLo installations also resort under *Wet Verontreiniging Oppervlaktewateren*. This means the company requires a permit for discharge of waste water. Required procedures were included in the procedures for WABO.

On provincial level, JaLo has had to perform an indicative study in the framework of *Milieu-effect-rapportage* (M.e.r.). The study outcomes are documented and decisions on any further procedures are decided on the basis of it.

Regulations regarding ground water do not apply for JaLo, as it is based outside any areas where drinking water is produced. The same applies for provisions in the framework of *Provinciale Milieuverordening Overijssel*, for *stilte-gebieden* or other areas with special requirements. JaLo does not operate within such areas, thus no procedures are required.

No adaptations are required of the *bestemmingsplan,* In the current plan, JaLo's terrain is part of "Regionaal Bedrijventerrein Twente (RBT)"

In accordance with *Wet Bevordering Integriteitsbeoordelingen door het Openbaar Bestuur* (BIBOB), JaLo has had its integrity successfully checked. This law is to prevent permits and subsidies are used for criminal activities.
On European level, JaLo must comply with IPPC guidelines, regulating integrated prevention and counteraction of contamination. IPCC has a list of 130 requirements.
In the frameworks of de *Vogelrichtlijn* and *Habitatrichtlijn*, no impact testing is required for JaLo's installations. The closest Natura-2000 areas, Wierdense Veld and Borkeld, are not within three kilometres from the installation. Also, JaLo installations are not within or bordering with the *Ecologische Hoofd Structuur* (EHS).

3.2.5 NTA 8080 provisions for consultation of stakeholders

For NTA 8080 certification, organizations must consult all parties that have some interest in the area where the biomass production is (being) established. These parties are referred to as stakeholders. The following definition is used in the NTA 8080, whereas the specification of "direct stakeholders" was added in a guidance document to the NTA 8081.

Stakeholders defined by NTA 8080:
organization and persons, not being the manager and/or owner of the production unit, who have interest in the management of an area, like the local population, indigenous people or organizations representing their interest as well as local or national environmental organizations and labour unions

Further specification in NTA 8081 guidance document:
Direct stakeholders of the producer of primary biomass include at least:
a) landowner(s) and land user(s);
b) local residents.

Stakeholders are expected to be involved in the following activities:

- Determining areas of "high conservation value"
- Determining "objects with cultural, ecological, economic or religious value which shall be maintained"
- Determining the use of local residual products that would become no longer available for local use
- Determining who obtains authority and management over the land used for the production unit
- Enlarging the involvement of the local population

So-called "small-holders" are exempted of these requirements. Definitions of small-holder may vary in accordance with national legislation.

Additional guidance to the consultation process is given:

- Identify, register and invite national and local stakeholders to participate in the consultation of stakeholders
- Consult the identified stakeholder who expressed their willingness to participate in the consultation
- Consult each identified stakeholder or group of stakeholders as often as needed, but at least once per five years

- Ensure that the stakeholders are informed about all cases to which the need is made known, unless this is evidently severely harmful for the competitive position of the organization.
- Take applicable measures to solve substantive differences in opinion with parties concerned.

3.2.6 JaLo's Stakeholder consultations

According to Tjipke Hoekstra from Control Union Certifications, organizations that are granted the *milieuvergunning* (section 3.2.4), automatically comply with the NTA 8080 requirements described in section 3.2.5. In issuance of the license , all applicable stakeholders have, by law, been given ample opportunity to raise their voice against the operation. This is true then also for JaLo Biopellets Twente.

According to Welhuis *et al* (2010), JaLo has engaged in multiple stakeholder consultation activities. The company has organized one meeting before the village council of Almelo. Initially, council members had a somewhat sceptical attitude, due to previous negative experiences with a similar company, producing briquettes for energy purposes. This attitude has improved much since.

JaLo has organized several stakeholder consultation meetings. Some of them were attended by the *buurtschapsraad* (neighbourhood council). On other occasions, the representatives of all important stakeholder organizations were invited. Phone calls and e-mail exchanges with organizations and individuals are occurring all the time and so do visits to the company, for example by school classes.

Whether or not these activities cover the NTA 8080 requirements remains to be verified by a Certification Body. However, JaLo seems to connect well with the interests and concerns of important stakeholder and the larger community. Following chapters may provide further evidence on that. Also relevant are JaLo's receipt of letters of intent for biomass supply, signed by the municipality of *Dinkelland* and NGO *Natuurmonumenten*.

3.3 Use of Sustainability Framework tools

The NTA 8080 documentation and legal requirements were not addressed by the ME4 project. These requirements apply on organizational level, for which the framework tools have not been developed, presumably.
Regarding stakeholder consultations, this aspect is covered by a manual. This manual describes factors that influence how well (or not) a biomass related project is received by the public and direct stakeholders. The author has extensive experience with the topic, as researcher and through practical cases. One of her findings is that by allowing actors with a direct stake in the project activities to participate at different stages of the project, planned activities and outcomes are more likely to be met with acceptance and support.

A number of steps are described, that may help improve the contextual embedding of a biomass related project:

1. Explain the project. Through use of e.g. visual tools, people get a better understanding of the project. This will raise their awareness, and sense of control of the project outcomes. They may also learn that the project developers do care about the community, the environment, etc.

   JaLo has organized various such events, attended by the village council, neighbourhood council, NGO's and others. This has been discussed in section 3.2.6.

2. Probe for "negative history". Find out if there have been negative experiences with similar projects in the past and be aware of any related sensitivities. Previous bad experiences may lead stakeholders to assume a sceptical attitude and less willingness to cooperate or accept biomass projects.
   Interestingly, JaLo has had such experience. The company initially encountered some resistance from the village council in Almelo, due to previous negative experiences with a company producing biomass briquettes. Eventually, this worked out well for JaLo, fortunately.

3. Define stakeholders. Perform a stakeholder analysis and establish their role and position as NGO, government, private company or other. It is crucial for any project to understand their interests, activities and conflicts.

   JaLo is a well-established company in the Twente region and has engaged with a broad range of stakeholders: governments, NGO, companies, financers, and others.

4. Make a project "longlist" of negative and positive project contributions. Make sure the project organization can anticipate any nuisances produced by the project. This may include noise, odour, visual disturbance and other. These nuisances will be picked up on by the public and the project should be well prepared for that. The same applies for positive contributions, such as employment generation. In a workshop (point 5), these factors can sometimes be quantified (e.g. number of transport movements), or else, qualitatively assessed.

   Presumably, JaLo has not performed such workshop, but the company has anticipated potential nuisances. By investing in state-of-art technology, disturbances such as noise, odour and fine dust emissions are being avoided. Besides, these nuisances are covered by national regulations (chapter 2 and 7).

5. Prepare a participatory workshop. Use simple, transparent tools for maximum exchange with participants. Provide at all times opportunities for people to really participate and assume a role in project design. Possible workshop phases:

   - Discuss and revise the long list of project contributions (positive and negative)
   - Define weighing factors for non-quantifiable and qualitative issues
   - Rank quantitative indicators
   - Discuss the workshop results

   As to coverage by JaLo, see point 4.

6. Continue the consultation process. After the workshop, continue consultation of stakeholders. Share results with them and ask for their feedback at regular intervals.

   In a way, this step is being carried out by JaLo. The company maintains contact with a variety of organizations on a regular basis, by phone, e-mail and by other means. It seems, the company is enjoying a good level of social acceptance. See also chapter 9, for a description of contributions to the community.

This ME4 project framework tool describes a methodology for stakeholder consultations and thus takes an important step beyond the NTA 8080 standard. Currently, the NTA 8080 only lists minimum requirements, whereas no guidelines are provided as how to achieve these. Lessons learned in practical cases, such as described in the manual, should provide input for future, more operational, version of the NTA 8080.

4 Greenhouse gas emissions

4.1 Explanation

Section 5.2.1 of the NTA 8080 includes provisions for net GHG emission reductions. Throughout the biomass chain, net GHG emission reductions should be at least 70%, as compared to power plants using a mixture of fossil fuels. *Table 1* lists the requirements for net GHG emission reductions. As additional requirement, biomass production must not lead to reduced carbon sinks in the vegetation and in the soil.

Table 1: GHG emission reduction requirements

<table>
<tr><th colspan="4">NTA 8080 reference</th></tr>
<tr><td colspan="3">Sustainability requirements</td><td>5</td></tr>
<tr><td colspan="3">Greenhouse gas emissions</td><td>5.2</td></tr>
<tr><td colspan="3">Greenhouse gas balance

Principle 1: The greenhouse gas balance of the production chain and application of the biomass is positive

Criterion 1.1: In the application of biomass a net emission reduction of greenhouse gases shall take place along the whole chain. The reduction is calculated in relation to a reference situation with fossil fuels. The following table lists the indicative percentage of mandatory emission savings:

<table>
<tr><td>Installation</td><td>Fossil reference</td><td>Minimum requirement for net emission reduction of GHG</td></tr>
<tr><td>Co-firing in coal fired power plant</td><td>Electricity from coal fired power plant</td><td>70%</td></tr>
<tr><td>Co-firing in gas fired power plant</td><td>Electricity from gas fired power plant</td><td>50%</td></tr>
<tr><td>Other systems</td><td>Dutch mixture of electricity production</td><td>70%</td></tr>
</table>
</td><td>5.2.1</td></tr>
<tr><td colspan="3">Important carbon stocks

Principle 2: Biomass production is not at the expense of important carbon sinks in the vegetation and in the soil

Criterion 2.1: The conservation of above-ground (vegetation) carbon sinks when biomass units are planned

Criterion 2.2: The conservation of underground (soil) carbon sinks when biomass units are planned
Required actions by the organization:
1. Establish which carbon stocks will be lost in the vegetation and in the soil by the planning of a production unit preceding the planning of the new production unit
2. Establish whether these losses will be compensated by means of cultivation of the intended biomass during the next 10 years</td><td>5.2.2</td></tr>
</table>

4.2 JaLo NTA 8080 compliance

4.2.1 GHG emission calculation methodology

The greenhouse gas (GHG) emission calculations follow the methodology used in the Renewable Energy Directive by the European Commission (2009). This methodology is also applied in the NTA

8080 sustainability standard (2008). Both standards dictate minimum emission savings obtained from the biomass operations, as compared to use of fossil fuels. Requirements for net emission savings are prescribed for three reference situations listed in *Table 1.*

The following formula applies for calculating the net GHG emissions throughout the bio-energy chain:

$$E = E_{EC} + E_L + E_P + E_{TD} + E_U - E_{SCA} - E_{CCS} - E_{CCR} - E_{EE}$$

The calculation factors are explained in *Table 2*. The relevance of each factor for the JaLo pellet chain is mentioned in the third column.

Table 2: Calculation factors and relevance for the Egyptian rice straw biomass- to- energy chain

Symbol	Description	Relevance for JaLo bio-pellet chain
E	total emissions from the use of the fuel	Expressed in grams of CO_2 equivalent per Mega Joule (MJ) of pellet-generated electricity. Calculations are performed against two fossil fuel comparators: Dutch electricity production mix and natural gas – fired heating installations.
E_{EC}	emissions from the extraction or cultivation of raw materials	Includes cutting and chipping of wood and harvesting and baling of mowings.
E_L	annualized carbon stock changes caused by land use change	Not taken into consideration due to insufficient data availability.
E_P	emissions from processing	Includes milling, drying, pelletizing and cooling of pellets.
E_{TD}	emissions from transport and distribution	Separate emission factors are calculated for biomass supply to the pelletizer and pellet distribution to the Electricity plant.
E_U	emissions from the fuel in use	Kept at "0" in accordance with Renewable Energy Directive.
E_{SCA}	emission saving from soil carbon accumulation via improved agricultural management	Not taken into consideration due to insufficient data availability.
E_{CCS}	emission saving from carbon capture and geological storage	Not taken into consideration due to insufficient data availability.
E_{CCR}	emissions saving from carbon capture and replacement	Not taken into consideration due to insufficient data availability.
E_{EE}	emission saving from excess electricity from co-generation	Not taken into consideration due to insufficient data availability.

The following formula applies to calculate the greenhouse gas emissions savings from use of biofuels:

$$\text{Saving} = (E_F - E_B)/E_F$$

Where E_B = total emissions from the biofuel or bioliquid and E_F = total emissions from the fossil fuel comparator.

4.2.2 Manual calculations vs. CO_2-tool

To-be certified organizations are requested to use a special tool for calculating the carbon balance. This is the *Calculation tool for determining greenhouse gas emissions from the production of*

electricity, heat and transport fuels made from biomass, in short CO_2- tool. It is freely available on internet and includes a calculation program and several documents with explanations (http://www.senternovem.nl).
The NTA 8080 includes this tool under *normative reference document*s, "indispensible for the application of this NTA". However, according to Tjipke Hoekstra (2010) from Control Union Certifications, the Dutch Accreditation Council currently discourages the use of this tool. Instead, manual calculations are preferred, provided realistic data and clear source references are used.

An important obstacle of the tool is that its outcomes are based on a (limited) number of pre-programmed bio-energy chains. The tool designers did anticipate the need for parameter changes, to better suit specific users, but built-in features proved difficult to use. Similar conclusions were drawn by Koop *et al* (2010). The tool suffers from a general lack of transparency in the way calculations are performed. The user does not get insight in the way his input data leads to the tool outcomes – i.e. greenhouse gas emission figures. There is a need to make the CO_2 more user-friendly and transparent, if it is ever to help would-be NTA 8080 certified organizations to perform realistic GHG emission calculations.

4.2.3 Calculating the GHG emissions

The GHG emissions are calculated as CO_2-equivalent emissions, meaning that any CH_4 and N_2O emissions have been taken into account.
JaLo's GHG emission calculations are performed for two situations, described in Chapter 2: at the start-up of its operations and after 12 years. An additional distinction is made between two market scenario's: pellets used for co-firing in large-scale electricity plants and pellets used for heating purposes within the biomass production area. The latter include swimming pools, old-people's homes and other sites in the surroundings of the pellet plant, where decentralized, small-scale heating installations are deployed. In the first scenario, pellets substitute fossil coal, whereas in the second scenario pellets substitute natural gas. By December 2010, it was not clear which part of the pellets would find its way to either destination. After consultation with *Tjipke Hoekstra* from Control Union Certifications, it was decided to perform the GHG calculations for two virtual situations: where all pellets go to the electricity plant or regional heating installations respectively. For any pellets sent to either market under the NTA 8080 scheme, JaLo would have to demonstrate that the respective chain (i.e. biomass-to-electricity) or biomass-to-heat) is in compliance with the GHG emission savings requirements. The relative share of pellets going to either destination is not taken into account.
Basic chain information for the relevant emission factors (*Table 2*) is provided hereafter. The calculations and underlying specific chain information is not included, for confidentiality reasons. A summary of the calculations is presented in *Tables 3* and *4.*

<u>Harvesting and extraction of natural biomass (E_{EC})</u>
The wood from hedgerows is harvested with specialized equipment – a caterpillar/crane combination. The wood is then chipped and dumped in a container. On nutrient-poor hay lands, heath lands and other conservation areas, biomass is mowed, baled and then loaded on a truck. The resulting diesel use and GHG emission equivalent is taken into account.
This emission factor is more important in Situation 2 as compared to Situation 1, given that all biomass originates from landscape elements.

<u>Transport and distribution (E_{TD})</u>
Both industrial residues and natural biomass fractions are transported by truck to the pellet plant in Almelo. Trucks are also used for distribution of the pellets tot the customer. So as to distinguish both transport phases, they are referred to with emission factors E_{TD} 1 and E_{TD} 2 respectively (*Table 3*). The GHG emission calculations are based on diesel use.

So as to optimize logistics, JaLo is seeking to gradually increase its pellet sales in the surroundings of Almelo. The advantage is that pellet delivering trucks can transport a freight of biomass on their way back to the pellet plant. This may save significantly on transport cost and related GHG emissions. However, despite lower transport emissions, selling pellets in the surroundings of the pellet plant has a negative influence on the emission savings calculations. This is explained in section 4.2.4.

Biomass processing (E_P)
The biomass is processed in the pellet plant in Almelo, using electricity. The resulting emissions are calculated on the basis of kilowatt-hours of electricity used.

Total emissions from the biofuel (E_B)
Factor E_B is the sum of all GHG emission factors described above. *Table 3* and *Table 4* show the total emissions for Situation 1 and 2, respectively for pellets substituting fossil coal and natural gas.

4.2.4 Calculating the emission savings

The applied formula for GHG savings (4.2.1) compares grams of carbon dioxide equivalent emitted from the production and usage of a Mega Joule (MJ) of pellets (gCO_2- e /MJ_{pellet}), with grams of CO_2-e emitted from the production and use of fossil fuel. In accordance with both market scenario's , the comparison is made with both fossil coal and natural gas. *Table 3* and *Table 4* show the respective savings obtained for both market scenario's.

Pellets substituting fossil coal:

In *Table 3*, the left column for both situations (explained in chapter 2 and 4.2.3) shows the result of dividing the CO_2 -equivalent emissions per kilogram pellets by the Lower Heating Value (LHV) of pellets, which is assumed to be 18 MJ per kilogram (www.ecn.nl/Phyllis). The fossil reference (E_F) was taken from data by *Biograce* (111,28 gCO_2-eq/MJ hard coal). Figures in the second column are obtained through division by 0.42, assuming a fuel-to-electricity efficiency of 42% (both with and without pellet-cofiring).

Table 3 : Total GHG emissions and savings through substitution of fossil coal

Scenario 1: substituting ***fossil coal***				
	Situation 1		Situation 2	
Factor	***gCO2-e/MJ pellet***	***gCO2-e/MJ electricity***	***gCO2-e/MJ pellet***	***gCO2-e/MJ electricity***
E_{EC}	0.15	0.35	1.39	3.30
E_{TD} 1	2.70	6.44	2.07	4.93
E_P	3.75	8.93	3.75	8.93
E_{TD} 2	2.46	5.85	2.46	5.85
E_B (SUM)	**9.06**	**21.56**	**9.66**	**23.01**
	Emission savings relative to fossil fuel comparator (E_F):			
E_F	111.28	264.95	111.28	264.95
$(E_F-E_B)/E_F$	**91.86%**	**91.86%**	**91.32%**	**91.32%**

Pellets substituting natural gas:

Calculations for the first column in *Table 4* are performed in a similar way, albeit against a different fossil reference, of 67.59 grams of CO2-equivalent per MJ of natural gas (Biograce, 2008). Emission factor figures in the second column are obtained through division by 0.9, in accordance with an

expected pellet-to-heat efficiency of 90%. The figure for the respective fossil comparator seems counter-intuitive. However, this is due to the method of calculating the efficiency of gas fired heating installations (CV in Dutch). The efficiency is calculated as the amount of MJ of heat, divided by the Lower Heating Value (LHV) of natural gas. This LHV, however, does not include the energy that is recovered from emitted steam in modern gas installations. This explains why the calculated efficiency exceeds 100%; the figure 107% includes the recovery of heat energy from condensed steam.

Table 4 : Total GHG emissions and savings through substitution of natural gas

Scenario 2: substituting ***natural gas***				
	Situation 1		Situation 2	
Factor	***gCO2-e/MJ pellet***	***gCO2-e/MJ pellet heat***	***gCO2-e/MJ pellet***	***gCO2-e/MJ pellet heat***
E_{EC}	0.15	0.16	1.39	1.54
E_{TD} 1	2.70	3.00	2.07	2.30
E_P	3.75	4.17	3.75	4.17
E_{TD} 2	0.79	0.88	0.00	0.00
E_B (SUM)	**7.39**	**8.21**	**7.21**	**8.01**
	Emission savings relative to fossil fuel comparator (E_F):			
E_F	67.59	63.17	67.59	63.17
$(E_F-E_B)/E_F$	**89.07%**	**87.00%**	**89.34%**	**87.32%**

4.2.5 Discussing the calculation results

For both market scenario's, GHG emission savings stay well clear from the minimum savings requirements of 70% set by the NTA 8080 standard. As expected, the substitution of fossil coal in electricity plants leads to higher emission *savings* when compared to substitution of natural gas. This is because in the latter case, pellet use is compared with current use of natural gas in highly efficient heating installations. The resulting low fossil fuel comparator is only partially compensated for by a more efficient pellet-to- energy ratio of 90%, against 42% for pellet co-firing in electricity plants.

Emission savings may still be higher, though, in case JaLo's biomass qualifies for listing as *residue*, in Annex A of NTA 8080. This issue was discussed in section 1.4. If landscape biomass qualifies as *residue*, any emissions occurring during its production (e.g. cutting, mowing) would not count toward the overall GHG balance. Nevertheless, inclusion of harvesting and other up-stream energy consuming operations in GHG assessments, only seems fair. These emissions cannot be assigned to any main product, other than the pellets that are produced.

The remainder of emission factors mentioned in *Table 2* have not been considered in the GHG emission calculations, due to lack of reliable methodologies. And yet, these may be important in assessing the real importance of landscape management as instrument in reducing global GHG emissions. For example, coppice woodland management systems may help increase biomass stock and also reduce methane emissions, due to reduced presence of decaying material.

4.2.6 Maintaining important carbon stocks

As already explained in 4.2.5, JaLo is possibly compliant with the NTA 8080 provisions regarding maintenance of carbon stocks. Through application of the coppice harvesting system, the total biomass stock in landscape areas is likely to increase and overall emissions are reduced.

4.3 Use of Sustainability Framework tools

What is the scope of the Project Framework tools, in demonstrating compliance with GHG emissions requirements formulated in the NTA 8080 standard?

In ME4, the MITERRA model is used for calculations in relation with land use changes and effects on (soil) carbon stocks and GHG emissions. Presumably, the model is capable of calculating E_{EC}, E_L and E_{SCA}. Unfortunately, it was designed to perform these calculations for agricultural crops only – including energy crops. The woody residues and mowings used by JaLo Biopellets Twente, are not covered by this model.

5 Competition with food and local applications of biomass

5.1 Explanation

This section of the NTA 8080 addresses effects that occur when biomass production competes with other land uses. Depending on the type of biomass, an increase in its demand for energy purpose may result in increased food prices and increased pressure on land. As a consequence, extra land may be taken into production, with potentially negative effects on the greenhouse gas balance (chapter 4), biodiversity (chapter 6) and other sustainability aspects addressed in this report.

Producers must be aware that biomass production may influence the choice of biomass and the amount and type of land brought under cultivation, elsewhere. These indirect land use change (iLUC) effects may occur well beyond the producer's own region or continent. The international debate on iLUC is very much on-going and researchers around the world are seeking ways to quantify these effects. ILUC can potentially undermine sustainability of biomass chains, even if the *direct* effects, covered by the remainder of the NTA 8080 criteria, result overall positive. As long as there is no agreed upon *iLUC factor*, no biomass chain sustainability assessment can be called complete.

Table 5 includes reporting guidelines for organizations on expected indirect effects, regarding competition with food and local applications of biomass.

Table 5: Requirements regarding competition with food and local applications of biomass

NTA 8080 reference	
Sustainability requirements	5
Competition with food and local applications of biomass	5.3
***Principle 3**:* The production of biomass for energy shall not endanger the food supply and local biomass applications (energy supply, medicines, building materials)	
Criterion 3.1: Insight into the change of land use in the region of the biomass production unit. Criterion 3.2: Insight into the change of prices of food and land in the area of the biomass production unit. The organization shall report, at the request of the government, about the potential risk on indirect effects in the field of competition with food and local applications of biomass and effects of land use changes, directly associated with this. The duty for reporting includes the following components: • The nature of the raw material; • The production location; • The surface area of cultivation; • Information about land use changes in the region including future developments, when information is available; • Information about changes in land and food prices in the region including future developments, when information is available; • Information about the availability of biomass for food, energy supply, construction materials, medicines or otherwise on local and regional levels, and the relation if any with cultivation of energy crops, when information is available.	5.4.1

5.2 JaLo NTA 8080 compliance

According to Annex C of the NTA 8080, this risk of indirect land use changes (iLUC) is reduced when residual flows are used, provided these flows have no other useful applications.

As to the residues from wood based industries, used in Situation 1, a fraction of that is currently used for the production of fibreboard. Here JaLo can expect to produce some indirect effects,

through competing with alternative uses of residues. These effects, for this particular fraction of residues, will disappear when the transition to natural biomass is completed (Situation 2).

Regarding the natural biomass flow , this is produced on lands set aside for conservation purposes. Rather than adding pressure to available land, JaLo proposes better use of available land; hence, JaLo may be *avoiding* iLUC.

5.3 Use of Sustainability Framework tools

Currently, there is no universally accepted methodology for calculation of indirect effects (iLUC). What can be calculated, however, are the costs of *avoiding* iLUC , when land is used that is less suitable for food production and other alternative uses. These costs would consist of extra input requirements, such as fertilizer and opportunity costs.

The MITERRA model and calculation sheets produced by the ME4 project, presumably could be used to quantify iLUC avoidance. This requires intelligent linkages between economic, agricultural and environmental parameters.

At first glance, iLUC avoidance calculations seem less relevant for the JaLo pellet case. JaLo uses biomass with no current (food) value – hence the label of “residue”. However, comparisons could be made for different soil types used, with different potential for food production and specific alternatives. Calculations of iLUC avoidance costs could be based on differences in production between competitive and less competitive soils.

6 Biodiversity

6.1 Explanation

Table 6 lists the NTA 8080 biodiversity requirements, divided into five criteria. Each criterion is matched with 1 or 2 indicators, providing guidance as to how each criterion is to be met.

Table 6: Biodiversity requirements

NTA 8080 reference	
Sustainability requirements	5
Principle 4*: Biomass production does not affect protected or vulnerable biodiversity and will, where possible, strengthen biodiversity*	5.4
Criterion 4.1: No violation of national laws and regulations that are applicable to biomass production and the production area **Indicator 4.1***:* Relevant national and local regulations are complied with, with regard to land ownership and land use rights; forest and plantation management and exploitation; protected areas; wildlife management; hunting; spatial planning; national rules arising from the signing of international conventions, i.e. Convention on Biological Diversity and Convention on International Trade in Endangered Species.	5.4.1
Criterion 4.2: In new or recent planning, no deterioration of biodiversity in protected areas **Indicator 4.2**: Biomass production does not take place in recently cultivated areas that have been recognized as 'gazetted protected areas' by the government, or in a 5 km zone around these areas. […] If biomass production does take place in the above areas, then only if this is a part of the management to protect the biodiversity values.	5.4.2
Criterion 4.3: In new or recent planning, no deterioration of biodiversity in other areas with high biodiversity value, vulnerability or high agrarian, nature and/or cultural values. **Indicator 4.3**: Biomass production does not take place in recently cultivated areas that have been recognized as 'High Conservation Value' (HCV) areas by the parties involved, or in a 5 km zone around these areas […] The following areas are considered HCV areas: • areas with endangered or protected species or ecosystems, on the basis of the criteria of HCV categories 1, 2 and 3; • areas with high vulnerability (e.g. slopes and wetlands), on the basis of the criteria of HCV category 4; • areas with high nature and cultural values, on the basis of the criteria of HCV; • categories 5 and 6 and criteria for 'high nature value farmlands'. If biomass production does take place in the above areas, then only if this is a part of the management to protect the biodiversity values.	5.4.3
Criterion 4.4: In new or recent planning, maintenance or recovery of biodiversity within biomass production unit. **Indicator 4.4.1:** If biomass production is taking place in recently cultivated areas (after 1 January 2007), room will be given to set-aside areas (at least10 %). **Indicator 4.4.2 (reporting):** If biomass production is taking place in recently cultivated areas (after 1 January 2007), it has to be indicated in which land use zones the biomass production unit can be found; • how fragmentation is discouraged; • if ecological corridors are applied; • if the restoration of degraded areas is involved here	5.4.4
Criterion 4.5: Strengthening of biodiversity where this is possible, during planning and existing production units. **Indicator 4.5 (reporting):** Good practices are applied on and around the biomass production unit for the strengthening of biodiversity, to take into account ecological corridors and to prevent disintegration as much as possible.	5.4.5

6.2 JaLo NTA 8080 compliance

JaLo uses biomass from areas with some kind of conservation purpose. For NTA 8080 certification, it will be important to demonstrate that biodiversity is not harmed.

6.2.1 National laws and regulations

Laws and regulations are covered in section 3.2.4, with mentioning of the Bids Directive and Habitat Directive. As the indicator suggests, also the international conventions on biodiversity (CBD) and endangered species (CITES) should be complied with, if not already covered in national regulations. Presumably, by being granted the *milieuvergunning,* JaLo is compliant with all biodiversity requirements in the NTA 8080.

6.2.2 Protected areas

An important reference are Natura-2000 sites, forming an ecological network of protected areas under E.U. legislation. The basis for these areas is formed by the Habitat Directive and Birds Directive. The Natura-2000 sites closest to the JaLo pellet plant are *Wierdense Veld* and *Borkeld*. These are situated at sufficient distance from the pellet installations.
Well-known protected areas in the region such as *Weerribben-Wieden* National Park are at significant distance from the pellet plant installations. JaLo is considering the possibility of using reed from these, and other, wetland areas as source for its biomass pellets. Harvesting operations in reed lands, including in Weerribben-Wieden, are already carried out by *Staatsbosbeheer* and *Natuurmonumenten*, albeit not for energy purposes. Using reed for energy pellets may be a promising tool for long-term financing of wetland protection programs. Studies have suggested that, like with hedgerows and other landscape elements, reed lands may actually benefit from management operations under certain conditions. The NTA 8080 leaves this possibility open, as can be read under *indicator 4.2.*

6.2.3 Areas with high conservation value

JaLo Biopellets Twente is situated in a national protected landscape area: *Nationaal Landschap Noord-Oost Twente.* As such, it has been set aside as one of twenty landscapes in the Netherlands of extraordinary historical, cultural and biological value. Economic activities are promoted that take advantage of the area's special feature. JaLo is tuning into that, by connecting the region's valuable landscape and natural features with economic opportunities. As such, JaLo may help establish new standards for landscape conservation, equally applicable in areas of similar qualities, elsewhere in the Netherlands. Governments and conservation organizations alike, seem to acknowledge the importance of JaLo activities as a pilot project, judging by their support.

6.2.4 Maintenance and recovery of biodiversity

The pellet plant will be bordering an *eco-zone,* an area of special biological interest. A 40-meter wide band of brushwood, typical of the *eco-zone,* will attract birds and insects. Trees will be planted and a basement built, providing shelter for bat species. Well aware of the importance of public support, JaLo will step up its educational role. Visitors are offered tours around the pellet plant and ecological zone. Paths and shelters and a large window are built, to provide view over the eco-zone. Visual disturbance of the installation itself is minimized, by elevating the adjacent land with sand and vegetation.

Effectively, JaLo is going to (re)introduce a traditional management system for woodlands, called *coppice woodland,* characterized by rotational harvesting schemes. According to Kuiper *et al* (2001), maintaining this traditional harvesting system is crucial for maintaining biodiversity. Butterflies, amphibians, reptiles, birds and mammals all benefit from the structural variation of this landscape type. By no interference in these areas, the trees grow higher and denser. The subsequent decline in light reaching the soil, generally leads to reduced biodiversity.

Part of the decline of coppice woodlands is due to the absence of wood markets and the high costs involved in mandatory removal of woody material labelled as "waste" under Dutch law (chapter 3). This leaves some woodland managers inclined to leave part of the wood in the field or dumped in ditches. The resulting obstruction of regeneration capacity and water flows, will eventually lead to deterioration of biodiversity (Kuiper *et al*, 2001).

Extraction of wood for energy purpose could contribute to maintaining coppice woodland as landscape element, and thus help protect its associated flora and fauna. Yet, it will be important to leave a minimum amount of wood the field, as it provides shelter and nesting sites for birds and small mammals. In the greenhouse gas emission calculations (chapter 4), 10% of the landscape areas available for harvesting was assumed to be left aside by JaLo. This percentage conforms to the indicator in NTA 8080 (*Table 5*).

Conform the Forest Law (*Boswet*), managers of coppice woodlands are not obliged to report wood removal, provided regeneration is not hampered. If no regeneration occurs after harvesting, replanting will be required. However, woodland managers should at all times inform with authorities about the particular definitions and standards that apply in their area (Kuiper *et al*, 2001).

6.2.5 Strengthening of biodiversity

Most of what is said under 6.2.4, could be added in this section. As extra contribution to biodiversity, JaLo intends to build a bat-cave, providing shelter for bats. And the comments made on maintaining biodiversity, apply as much to strengthening it.

6.3 Use of Sustainability Framework tools

No tools are used in the ME4 project, that specifically cover any of the biodiversity related NTA 8080 requirements. The MITERRA model currently only includes measures for environmental impact and GHG emissions.

On the other hand, the manual about stakeholder consultations includes methods to involve a complete range of stakeholders. By necessity, these must include experts on biodiversity. Workshops and exchange meetings are anticipated, where such experts contribute with recommended adaptations to biomass based business set-ups, that should benefit biodiversity. Some of these measures are described in *section 6.2.4*.

7 Environment

7.1 Explanation

In the environmental permit, the JaLo pellet plant is referred to as “installations for storage, mechanical processing and combustion of externally originating waste streams”. As its operations cover the entire biomass chain, JaLo potentially has a large impact on the environment. Many concerns have been addressed by national legislation, through the granted environmental permit, discussed in chapter 3. *Table 7* lists the NTA 8080 environmental requirements and indicators, divided into provisions for 1)soil, 2)ground and surface water and 3) air.

7.2 JaLo NTA 8080 compliance

7.2.1 Soil impact assessment

A soil risk analysis was performed for the environmental permit. The result showed little risk of soil pollution, given that the materials used are dry and clean (List A). For extra precaution, JaLo is going to build a half-open biomass storage facility (allowing natural drying process) and liquid-resistant flooring. The ash and domestic waste produced, is safely transported away from the installation. The sand, clay and gravel filtered out of the biomass, is also safely removed.

As to criteria 5.2, no fertilizers and no agro-chemicals are used in the biomass production areas.
And regarding criteria 5.2 and 5.3, the MITERRA model may be helpful in estimating maximum biomass removal figures, without affecting the soil nutrient stock. But, in anticipation of that, it can be safely assumed that sustainability of woodland harvesting is guaranteed by the applied centuries-old coppice system. Besides, in current non-management situation, large amounts of nutrients are lost through emissions of methane. This suggests that relatively simple net reductions of greenhouse gas emissions can be obtained, through rotational harvesting systems. This aspect too, should be made quantifiable with help from, possibly, MITERRA.

7.2.2 Ground and surface water impact assessment

As included in the procedures for the environmental permit, JaLo has applied for a permit resorting under *Wet Verontreiniging Oppervlaktewater.* Both were granted simultaneously. This included an assessment of three flows of waste water expected to occur in the JaLo installations: domestic water, precipitation (*hemelwater*) and percolation water. The half-open storage facility reduces the amount of percolation water. And, the measured quality was such that there was no risk of contamination. The installation design is such that no water flows occur during processing. There is no water cooling and production is continuous, so that installations maintain the right temperatures and no condense water is allowed to occur. All water that escapes, is emitted as water vapour.
As described in 6.2.4, applying coppice harvesting systems may help maintain water flows in woodland areas.

Table 7: Requirements for environmental impact

NTA 8080 reference	
Sustainability requirements	5
Environment	5.5
Soil ***Principle 5***: In biomass production and conversion, soil and soil quality are retained or even improved. ***Criterion 5.1***: No violation of national laws and regulations that are applicable to soil management. ***Indicator 5.1.1***: Relevant national and local regulations are complied with, with respect to waste management; use of agrochemicals (fertilizers and pesticides); the mineral system; the prevention of soil erosion; company audits. At least the Stockholm convention (12 most harmful pesticides) shall be complied with, also where national legislation is lacking. **Criterion 5.2**: In the production and conversion of biomass best practices are applied to retain or improve the soil and soil quality. ***Indicator 5.2.1 (reporting)***: The formulation and application of a strategy aimed at sustainable soil management for the prevention and control of erosion; conservation of nutrient balance; conservation of organic matter in the soil; prevention of soil salination. ***Criterion 5.3:*** The use of residual products is not at variance with other local functions for the conservation of the soil. ***Indicator 5.3. (reporting)***: The use of agrarian residual products is not at the expense of other essential functions for the maintenance of the soil and the soil quality (such as organic matter, mulch, straw for housing). The residual products of the biomass production and conversion are used optimally (so, for example, no unnecessary burning or removal).	5.5.1
Ground and surface water ***Principle 6:*** In the production and conversion of biomass, ground and surface water are not depleted and the water quality is maintained or improved **Criterion 6.1**: No violation of national laws and regulations that are applicable to water management. **Indicator 6.1.1**: Relevant national and local laws and regulations are observed, with respect to the use of irrigation water; the use of ground water; the use of water for agrarian purposes in catchment areas; water purification; environmental impact assessments; company audits. **Criterion 6.2**: In the production and conversion of biomass best practices are applied to restrict the use of water and to retain or improve ground and surface water quality. **Indicator 6.2.1 (reporting):** The formulation and application of a strategy aimed at sustainable water management with regard to 1) efficient use of water; 2) responsible use of agrochemicals. **Criterion 6.3**: In biomass production and conversion, no use of water from non-renewable sources. **Indicator 6.3.1**: Irrigation or water for the processing industry does not originate from non-renewable sources.	5.5.2
Air **Principle 7***:* In the production and conversion of biomass, the air quality is maintained or improved **Criterion 7.1**: No violation of national laws and regulations applicable to emissions and air quality. **Indicator 7.1.1:** Relevant national and local regulations are observed with respect to air emissions; waste management; environmental impact assessments; company audits. **Criterion 7.2**: In the production and conversion of biomass best practices are applied to reduce emissions and air pollution. **Indicator 7.2.1 (reporting):** The formulation and application of a strategy aimed at minimum air emissions, with regard to 1) production and conversion; 2) waste management. **Criterion 7.3:** No burning as part of the planning or management of biomass production units (BPUs). **Indicator 7.3.1:** Burning is not applied in the planning or the management of biomass production units, unless in specific situations as described in ASEAN guidelines or other regional good practices.	5.5.3

7.2.3 Air impact assessment

The *Wet Milieubeheer* (3.2.4) includes two sections that cover air quality and odour guidelines respectively: *Kader Wet luchtkwaliteit* and *Kader geurbeleid*. Regarding these issues, JaLo has had to produce an indicative study, to assess whether further testing is needed and documented in a *Milieu Effect Rapportage* (M.E.R.). The study was conducted by a consultancy agency.

In this study, all potential JaLo sources of fine dust and NOx were assessed: the biomass stove, trucks and cars and the hammer mills. JaLo will install special electrostatic filters, also successfully used in a Danish factory. These will help reduce emissions to a minimum. The indicative study result found that JaLo contribution to fine dust and NOx is less than 1 percent as compared to the background concentration. This means JaLo emissions are non-significant and no further testing is required. For quantification of expected fine dust and NOx emissions by JaLo, we refer to Meesters *et al* (2008).

The odour emissions were described qualitatively in the study and descriptions were based on experiences of similar installations in Germany and Denmark. Results are based on the assumption that only wood is used. Organic waste for example, such as household trash and leaves, are not allowed as they are prone to rotting and subsequent foul odour emissions. Emissions were studied regarding 1) chipping of biomass and 2) the combined affluent of smoke and drying air. Ad 1: chipping principally occurs in the field, only a small fraction in the installation itself, and the odour emissions are not considered disturbing. Ad 2: odour components are effectively captured in filters and all processes take place internally. Also an oven is used that is designed and maintained for complete burning of the biomass, resulting in very limited odour emissions. Hence, the indicative study revealed that no follow-up tests and no *M.E.R* are required.

7.3 Use of Sustainability Framework tools

Within the ME4 project, the MITERRA model is used for measuring environmental impacts. This includes land use and land use change effects on soil nutrients, albeit that there is no coverage of wood harvesting. No tool is used in the project that describes impact on ground and surface water and air quality.
Regarding criteria 5.2 and 5.3 (*Table 7*), the MITERRA model may be adapted to estimate maximum biomass removal figures, without affecting the soil nutrient stock. The model may also be used to quantify the methane emission effects of maintaining hedgerows and woodlands in a coppice system, as compared to non-management.

8 Prosperity

8.1 Explanation

As *Table 8* suggests, JaLo has to report on its positive contribution towards the local economy and activities. This criterion should not be a big hurdle for a company like Jalo, as well embedded as it is in the Twente region.

Table 8: Prosperity requirements

NTA 8080 reference	
Sustainability requirements	5
Prosperity	5.6
Principle 8: The production of biomass contributes towards local prosperity **Criterion 8.1:** Positive contribution of private company activities towards the local economy and activities. **Indicator 8.1.1:** Description of: • The direct economic value that is created; • Policy, practice and the proportion of the budget spent on local supply companies; • The procedures for appointment of local staff and the share of local senior management. On the basis of Economic Performance Indicators EC 1, 6 & 7 of GRI (Global Reporting Initiative)	

8.2 JaLo NTA 8080 compliance

Approximately 100 people will be full-time employed for harvesting of biomass. Transport of biomass and pellet distribution will require around 7 or 8 truck drivers, whereas the pellet plant will employ an additional 18 people. Extra employment is generated indirectly, e.g. through truck maintenance and administrative tasks. All biomass related production activities will take place in the Twente region and it is even there where the pellets find their end users - provided sufficient contracts with clients are acquired eventually.

Apart from their core-business activities, JaLo initiators Jan Demmer and Louis Welhuis have made significant contributions to the larger community. A range of social and educational projects have been developed, involving investments in for example a traditional building with a sheep fold, a conference room and other recreational infrastructure. Activities and events such as lamb-nursing, sheep herding and sheep shearing, attract a variety of people from within and outside the community.

8.3 Use of Sustainability Framework tools

Within the ME4 project, an economic tool has been developed for assessing profitability of several crops. This includes willow, as a “second-generation biofuel”. JaLo will not be cultivating willow, but rather harvest it from hedgerows and coppice woodlands. Nevertheless, the model may still be useful. Its economic harvesting parameters could be used to assess profitability of harvesting willow and perhaps other wood species used by JaLo. A brief economic analysis of JaLo’s biomass activities is provided in Meesters *et al* (2008).

9 Social Wellbeing

9.1 Explanation

Social wellbeing requirements are listed in *Table 9*. Law BIBOB and the environmental permit (3.2.4) cover integrity, property and most of the worker health and safety issues addressed by the NTA 8080. Section 9.2 highlights some particular JaLo operations, grouped under working conditions, community safety and public interest.

Table 9: Social wellbeing requirements

NTA 8080 reference	
Sustainability requirements	5
Social wellbeing ***Principle 9***: The production of biomass contributes towards the social well-being of the employees and the local population	5.7
Working conditions **Criterion 9.1**: No negative effects on the working conditions of employees. **Indicator 9.1.1**: Comply with the Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy (compiled by the International Labour Organization).	5.7.1
Human Rights **Criterion 9.2**: No negative effects on human rights. **Indicator 9.2.1**: Comply with the Universal Declaration of Human Rights of the United Nations. It concerns here: non-discrimination; freedom of trade union organization, child labour; forced and compulsory labour; disciplinary practices, safety practices and the rights of indigenous peoples.	5.7.2
Property Rights **Criterion 9.3**: The use of land does not lead to the violation of official property and use, and customary law without the free and prior consent of the sufficiently informed local population. **Indicator 9.3.1:** Comply with the following requirements: no land use without the informed consent of original users; land use has been described carefully and laid down officially; official property and use, and customary law of the indigenous population are recognized and respected.	5.7.3
Contribution to social wellbeing of the local population **Criterion 9.4**: Positive contribution to the well-being of local population **Indicator 9.4.1**: Description of programmes and practices to determine and manage the effects of company activities on local population. On the basis of the Social Performance Indicator SO1 of the GRI (Global Reporting Initiative)	5.7.4
Integrity of the company **Criterion 9.5**: Insight into possible violations of the integrity of the company **Indicator 9.5.1**: Description of: degree of training and risk analysis to prevent corruption; actions taken in response to cases of corruption. On the basis of the Social Performance indicators SO2, SO3 and SO4 of the GRI (Global Reporting Initiative).	5.7.5

9.2 JaLo NTA 8080 compliance

9.2.1 Working conditions

JaLo has documented procedures for tasks aiming at minimizing environmental impact and maximizing safety. The employees are kept informed of these on a regular basis and are instructed on issues such as economic use of energy and resources and operation of fire extinguishers.

9.2.2 Community safety

JaLo invests in state-of-art technologies, such as hammermills that grind biomass rather than smash it. These operate in a room built below ground level and with sound-proof walling. Noise pollution is further reduced by building the entire installation facing the A35 highway, rather than facing nearby homes. The environmental permit required an acoustic study be conducted. Results showed JaLo meets the maximum decibel limits established in the framework of *Wet geluidshinder* (3.2.4).
Fine dust emissions are also reduced to a minimum (chapter 7) and interregional transport movements can be fully absorbed by the A35 highway.

Fire risks are minimized, e.g. by storing biomass no longer than one week and through early detection equipment, a sprinkler installation and a direct phone line to the fire department. The oven has an explosion-proof (ATEX) casing. Additional risks, such as in relation with fuel storage, have also been ruled out; no obstacles were encountered in the frameworks of *Besluit Risico's Zware Ongevallen* (BRZO) and *Besluit Externe Veiligheid Inrichtingen*.

9.2.3 Public interests

The contribution by both JaLo initiators to the community goes much further than just reduction of safety and pollution risks. Its recently built sheep fold, in traditional Twente style, is meant to attract interest from a wide audience. Groups of special interest, handicapped and the general public can all experience the rearing of lambs, sheep herding activities and sheep shearing contests. Also JaLo's pellet plant will provide additional community services, e.g. through facilities (chapter 6) that allow visitors to engage with the surrounding landscape.

9.3 Use of Sustainability Framework tools

The ME4 project manual described in 3.3 includes a methodology for consultation of a wide variety of stakeholders, as well as their active participation. This should help guarantee that concerns and interests of the community are not only heard, but also taken into account. In describing a practical methodology, this framework tool is an important step beyond the NTA 8080 requirements.

10 Conclusions and recommendations

10.1 Is landscape biomass use for energy purposes certifiable?

The study revealed that JaLo is compliant with most, if not all, sustainability requirements of the NTA 8080. This has much to do with the context in which the company operates: the Netherlands, where strong legal frameworks are in place. With the principle regulatory hurdle taken – the environmental permit – JaLo is effectively compliant with requirements covering multiple sustainability components at once. These include environment, biodiversity, stakeholder consultations and social wellbeing.

The remainder of NTA 8080 requirements seem well covered too. JaLo is a company well embedded in the Twente region. Both JaLo initiators, entrepreneurs Jan Demmer and Louis Welhuis, have made contributions to the larger community that go beyond their core-business. Investments in ecological features of the pellet plant and various recreational facilities make for significant contributions to the environment, biodiversity, prosperity and social wellbeing.

So, is the use of landscape biomass for energy purposes certifiable against NTA 8080? The study results suggest an affirmative answer. For the specific case of JaLo, this question remains to be answered by a Certification Body, should JaLo opt for certification procedures as explained in chapter 1.

10.2 How do project framework tools compare with NTA 8080?

The ME4 project framework tools cover (parts of) environment, greenhouse gas balance, stakeholder consultations and prosperity. The remainder of NTA 8080 sustainability components are not covered, or only indirectly. Non-coverage of documentation and legality requirements is understandable, given that the tools were not designed for assessment of specific organizations.
Indirectly, additional NTA 8080 requirements may be covered by the stakeholder consultation methodology described in the manual. Provided it aims to include stakeholders that sufficiently cover the NTA 8080 scope, sustainability could significantly improve through their input. However, the stakeholder methodology needs testing first, as well as alignment with NTA 8080.

For a more detailed description of the significance of each tool, we refer to the relevant chapters.
Table 10 provides a summary, listing the NTA 8080 coverage of each tool, its current usability and limitations in biomass chain assessments and its potential for improvements. The potential of each tool is further elaborated on in *10.4.*

Table 10: ME4 Sustainability Framework tools

Tool	***NTA coverage***	***Current applicability***	***Limitations***	***Potential (?)***
MITERRA model	o Environment (soil only) o GHG balance	o (Soil) carbon stock o GHG emissions	o No wood chains o No surface and ground water o No air	o Interlink parameters for environment, biodiversity and economics
Manual	o Stakeholder consultations	o Methodology for improved stakeholder involvement	o Not tested in real case	o Include participation by stakeholders covering all NTA 8080 components
Economic tool	o Prosperity	o Profitability assessment of willow harvesting	o No wood from nature/ landscape management	o Include non-cultivated wood and non-wood landscape biomass o Include iLUC avoidance costs

10.3 How does NTA 8080/8081 match up with Dutch reality?

As discussed, the NTA 8080 requirements seem to match well with Dutch laws and regulations. This is perhaps no surprise for a standard that was developed in the Netherlands. Real test cases will be awaiting, when the standard is applied in countries with less developed institutions and legal frameworks.

There is at least one NTA 8080 issue that needs resolving for the Dutch context, however, discussed in section 1.4. This involves the unclear status of landscape biomass, as residue or as main product and the potential conflict with requirements in the Renewable Energy Directive. Now biomass producers are not sure if they must comply with all requirements, or just with the requirements regarding greenhouse gas balance and soil quality. Also dependent on the label of "residue", is the question whether biomass harvesting and extraction should count toward the overall greenhouse gas balance.

10.4 Recommendations for sustainable biomass-to-energy projects

10.4.1 Recommendations for ME4 partners

ME4 project partners may want to look for improved NTA 8080 coverage by their sustainability framework tools. Perhaps the MITERRA model could be developed to include non-agricultural biomass and indicators for biodiversity, surface and ground water and air.
The economic tool could perhaps be developed to calculate the costs of avoiding indirect land use changes (iLUC) for a variety of agricultural and non-agricultural biomass types. Presumably, this could be measured against performance on a variety of soil types, with different levels of competitiveness against alternative uses (food and non-food). Such tool may be instrumental in establishing the *niche* for different biomass crops, taking into account both direct and indirect effects. Regarding the manual, it is recommended to test the stakeholder consultation methodology in the field and align it with the NTA 8080.

10.4.2 Recommendations for developers of sustainability tools

- Developers of the NTA 8080 may want to revise the definition of "residue" and adapt Annex A accordingly. This would have to include adding more biomass materials that qualify as residue.

- Perhaps certain incentives could be incorporated into the NTA 8080 requirements, that benefit organizations that do more than just complying with minimum sustainability requirements. It seems only fair to distinguish the "excellent" from the "average" and reward those who are fully committed to sustainability.

- There is a need for calculation methodologies, e.g. to quantify emissions and savings from managed as compared to unmanaged landscape elements. Extraction of landscape wood may curb methane emissions and help increase overall biomass stock in rural areas. Development of these methodologies should lead to better understanding of the real potential of landscape biomass-to-energy operations, as instrument for reduced global GHG emissions.

- The *CO_2-Tool* referred to in the NTA 8080 needs further improvements of its user-friendliness and transparency in greenhouse gas emission calculations. It should also include more variety of biomass materials.

- The NTA 8080 and its targeted users may benefit from inclusion of developed methodologies, thoroughly tested in the field, e.g. regarding stakeholder consultations.

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Annex : JaLo pellet chain flow-chart