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USING BIOMASS AS SUBSTITUTE FOR PEAT – EXAMPLES FOR WET PEATLAND MANAGEMENT (PALUDICULTURE) IN BELARUS

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SUMMARY

The wet and sustainable utilisation of degraded and abandoned peatlands (paludiculture), with site adapted harvesting machinery and the combustion of the harvested biomass is an innovative approach in peatland management. Recently two pilots for the substitution of peat with biomass from rewetted peatlands have been realised in Belarus in Lida District of Grodno Region and Sporovski zakaznik (Berioza District). The pilots cover the development (in the former), and the analysis of a fully set up (in the latter), of production chains for the harvesting of biomass for biofuel production (sensu stricto).

It is envisaged in both pilots that an EU funded project will aid the further implementation and optimisation of paludiculture and its product chains, in close cooperation with national research institutions.

KEYWORDS: Paludiculture, Rewetting, Biofuels, Peat Factory, Biomass

INTRODUCTION

The growing demand for biofuels increasingly competes with food production on agricultural lands, and also on organic soils. At the same time any conventional utilisation of drained peatlands (e.g. agriculture and peat excavation for so called ‘biofuel’production) does enhance Greenhouse Gas (GHG) emissions. The Rewetting of peatlands provides additional areas for cultivating biomass for energy generation under constantly wet conditions and offers a double benefit for emissions reduction by: 1) minimising peat mineralisation and the continuous release of CO_2 and N_2O from drained peatlands and 2) substitutitution of fossil fuels by biomass production (paludiculture). In the long run, peat accumulation may even be re-installed leading to a net sequestration of carbon.

Peat is fossil organic material (sequestered over millennia) and, under climate change mitigation aspects, not a suitable substitute for fossil fuels (Joosten 2007). With the thermal utilisation of biomass harvested in paludiculture, a renewable (annually) substitute for fossil fuels can be generated (biofuel sensu stricto). If, in addition, peat fuel is substituted by such

biomass, local peat excavation is reduced and sustainable development of degraded peatlands can be implemented. Currently the paludiculture concept (Wichtmann and Joosten 2007, Schröder et al. 2012, this issue) is under evaluation and optimisation at two different sites in Belarus within an EU-Aid funded project (Wichtmann 2011).

Paludiculture

Living mires display high genetic, species and ecosystem diversity and store enormous amounts of fresh water and carbon. Most mires – in Europe– have been drained and ameliorated for peat excavation or agricultural use and remain as degraded peatlands. This has led to the loss of biodiversity and large GHG emissions (Tanneberger and Wichtmann 2011).

Paludiculture means rewetting of degraded peatlands and consequent sustainable utilisation with site adapted harvesting machinery and management concepts (constant high water-levels, winter harvest, no fertilisation). It thus realises the integration of peatland conservation and utilisation. The regeneration of the vegetation (adapted to wet conditions) can be initiated artificially by planting if the absence of seeds or diaspores prohibits a natural succession.

Paludiculture offers:

- climate change mitigation (avoidance of N_2O and CO_2 emissions and provision of cool humid air),
- habitats for rare and threatened species,
- renewable alternatives for fossil fuels and raw materials,
- perspectives for agriculture and tourism in rural areas.

Climate aspects of paludiculture

Nowadays, globally tens of millions of hectares of drained and degraded peatlands are responsible for over 3 Gtons of CO_2 emissions, representing a value of € 70,000 million per year (Joosten 2010). By burning fossil fuels, organic material is oxidized, that otherwise would have been preserved for millenia. In contrast to biomass, peat would – without exploitation – *not* end up in the atmosphere as CO_2. This applies whether the peat is 10, 1,000, or 100,000 years old. Therefore, combustion of peat leads to a net emission of CO_2 to the atmosphere**.** As peat has a lower calorific value than coal, oil or gas, burning peat produces more CO_2 per unit of generated energy than most other fossil fuels (Couwenberg 2007). This is largely determined by chemical properties that –without substantial net energy losses – cannot be altered. As a consequence, replacing other fossil fuels by peat will lead to higher CO_2 emissions. The increased CO_2 emission by peat combustion is not compensated by carbon sequestration in natural and pristine peatlands. Pristine peatlands have always been part of the greenhouse gas balance and do not provide an additional carbon sink for the compensation of the extra net emissions of peat combustion (Wichtmann et al. 2008). On the long run, only paludicultures provide a sustainable option for biofuel production in peatlands.

The ‘wetland energy’ project

Based on experiences from the BMU-ICI project “Restoring peatlands and applying concepts for sustainable management in Belarus” (Tanneberger and Wichtmann 2011), the Michael Succow Foundation applied for a two-step tender in the EU Aid thematic programme of the European Commission (EC) ‘Environment and sustainable management of natural resources,

including energy'. Project partners in Belarus are the International Sacharov Environmental University (ISEU) and the Institute for Nature Management (IfNM; former Peat Institute) of the National Academy of Sciences of Belarus, both located in Minsk, Belarus.

In January 2011 the project 'Implementation of new concepts for wet peatland management for the sustainable production of biomass-based energy (wetland-energy)' commenced. After official project registration with the Belarusian authorities in 2012, the first in-country activities in Belarus started.

Objectives

The project aims at the optimisation of the paludiculture concept applied in Belarus. From the rewetting of peatlands and their maintenance as wet meadows, the project will develop a pilot production chain and marketing of biomass for fuel briquettes,. The overall objective of the project is to establish sustainable energy production under the paludiculture concept.

The main objectives that are realised in the two pilots (see below) are:

- technical optimisation and economic evaluation of applied paludiculture in Belarus,
- monitoring of ecological and economical impacts of applied paludiculture in Belarus
- development of a marketing strategy for biomass briquettes and other biomass based fuels from wet peatlands;
- awareness raising on nationwide institutional level for synergies of nature protection and sustainable energy supply;
- integration of the local communities and implementation of local sustainable strategies (Local Agenda 21).

The ecological monitoring includes vegetation development and measurements of GHG emissions of harvested and non harvested wet peatland sites, as it is likely that cutting of grasses may influence the gas balance of the sites by shortcutting of gas flow from the root system to the atmosphere (Koppitz et al. 1999).

The establishment, application, and biodiversity management of peatlands, via paludiculture for biofuel generation, will be assessed for both pilots (area, conditions, and biomass potential). The economic evaluation of paludicultures in Belarus will be carried out on a national scale. Also the general marketing strategy for biomass briquettes and other biomass based fuels from wet peatlands will be verified for Belarus. Awareness raising on an institutional level for linking nature protection and sustainable energy supply/energy production will be realized on a nationwide scale.

The pilot sites in Belarus

For project implementation, two pilot sites have been chosen: one rewetted peat extraction site under the ownership of a peat factory that is already overgrown by reeds (Lida), and one abandoned wet peatland with near-natural vegetation that requires management for habitat improvement (Sporovo).

Lida: excavated, rewetted peatland Dokudovskoe

In Lida District of Grodno Region, at Dokudovskoe, excavated re-wetted sites belonging to a peat factory are already overgrown by reeds. In close cooperation with the peat factory and local enterprises, this biomass will now be used for biofuel generation. The peat factory near Lida was constructed in 1959. Its facilities are similar, in construction and capacity, to another 26 peat factories in Belarus. Productivity amounts to 300 – 500 t of briquettes per day. Products from the peat factory are exported to Sweden, Lithuania, and Poland (Wichtmann and Tanneberger 2009).

Concrete pilot project sites for paludiculture have to be identified in the scope of the project and a site adapted production chain for the harvesting and the processing of the biomass has to be established by purchasing and implementing special harvesting machinery, as well as drying, chopping, milling and briquetting equipment.

Sporovski: near-natural, wet peatland

The Sporovski zakaznik is situated in the Brest region, Berioza District with the Sporava peatland located in the floodplain of the Yaselda River. It is one of the largest, least modified floodplain mires in Belarus and Europe. The seasonally flooded site comprises a large flat alluvial plain and peatlands extend along a 35 km stretch of the Yaselda River. The current water management seems to be beneficial for the application of paludiculture (Wichtmann and Tanneberger 2009).

Here cooperation already exists with the Zakaznik (nature reserve) administration and APB Birdlife Belarus for habitat maintenance for the Aquatic Warbler (a strongly endangered passerine bird). Project activities at this site engaged the gradual bush encroachment and succession to forested peatlands.

Basic activities for paludiculture on very wet meadows are already realized on this site. A full production chain for biofuels is under construction in a project within the German International Climate Initiative (ICI) (2008 – 2012; Tanneberger and Wichtmann 2011) and will be the basis for further investigation e.g. on optimisation of operating procedures, economy and marketing of biofuels from paludiculture.

DISCUSSION AND CONCLUSION

Increasing demands for energy from alternative sources as well as sustainability requirements allow new options for the utilization of biomass from wet peatlands and make the paludiculture concept auspicious for the production of biofuels.

At the same time synergies with nature conservation goals can be realised by restoration and conservation of large (potential) breeding grounds of endangered species like the Aquatic Warbler.

Peat extraction enterprises, worldwide, should tackle the challenge of substituting the finite (and unsustainable) peat resource on their sites by learning from the experiences of the paludiculture pilots in Belarus.

The case studies presented demonstrate that it is possible to take responsibility for a limited resource (peat) by site adapted reclamation of degraded peatlands for the production of biofuels in paludicultures.

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