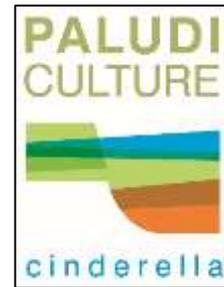


CINDERELLA - Update XVI

January 2018, W. Wichtmann

“Comparative analysis, integration and exemplary implementation of climate smart land use practices on organic soils: progressing paludicultures after centuries of peatland destruction and neglect” (CINDERELLA)



By irregular updates the CINDERELLA community and colleagues are informed about dates, news and other interesting issues within the scope of the CINDERELLA project, ref. paludiculture. All partners are kindly asked to provide current information, which can be inserted here. The idea is to keep all project partners informed on the same level, to exchange information, to ask project related current questions, to arrange meetings and to make appointments as well as to prepare common activities (publications, new projects, etc.).

Cinderella

The Cinderella project now comes to its end step by step. Closing dates in partner countries are a little bit different but will be latest end of March (Greifswald University successfully applied for cost neutral prolongation until 31st of March). We already had our final event, the rrr2017 conference end of September 2017 in Greifswald and the Peatland policy workshop together with the CAOS project in Brussels in December (for both see some summary in this update). Now all partners are busy with summarizing research activities, drafting publications on project results and reporting to the donors. This update shall give some overview on recent project related activities and news about developments referring to peatlands and paludiculture. Final full reports must be delivered **and** finally accepted until end of May/beginning of June 2018.



The FACCE JPI-ERA-NET Plus on Climate Smart Agriculture invited representatives from lead organisations of the projects supported within their funding schemes to join a concluding workshop end of March 2018. Further information will follow.

Growth patterns of early plant stages of *Typha latifolia* and *Typha angustifolia*, depending on different availabilities of the macronutrients N, P and K

Summary of the Master thesis at Greifswald University (in German): Anzucht von *Typha latifolia* und *Typha angustifolia* – Wachstumsexperimente mit Jungpflanzen bei unterschiedlichem Nährstoffangebot (N,P,K)

Nora Köhn

The aim of this study was to identify the exact range of nutrient availability (mainly N) in which the plants show a growth optimum. The study was conducted under laboratory conditions (under glass/at a greenhouse) for 60



days and includes a nitrogen gradient on peat and quartz sand as substrate (Figure 1). The gradient had 55 (peat) or 10 (quartz sand) steps from 0 to 1000 kg N/ha, which were the same for K and the amount of P was 1:10 in proportion to N. The N gradient on peat was repeated once, so altogether 110 experimental cups, and on quartz sand there was no repetition and the experiment contained 11 cups, together with one control on potting soil. Bog peat was chosen to guarantee low nutrient conditions and to raise the pH-value from 3 to 5-6, the peat was treated with NaOH.

Figure 1: Plastic cups with experimental plants at the greenhouse before the experiment was started.

The young plants were cultivated from seeds. Upon reaching a height of 18 cm, the plants were transplanted from potting soil to the experimental substrate. The plants received a nutrient solution twice a week with increasing concentration and other essential nutrients as a basic solution according to Hoagland & Arnon (1950). At the end of the experiment, the parameters leaf length, root length, weight and biomass element concentrations were measured.

Results: The results for *T. latifolia* and *T. angustifolia* do not differ that much, therefore only results for *T. latifolia* are mentioned below. The total leaf length of *T. latifolia* increased with increasing nutrient addition in both substrates. However, the incline was much higher at quartz sand (Figures below). A dependency of leaf length on nutrient addition was only found at quartz sand. This became clear with the coefficient of determination (R^2). All plants on peat show minor growth and most leaves become yellow and potentially die off.

Because of the pre-treatment with NaOH, peat has a much higher concentration of sodium than potting soil and quartz sand (Figure below, right). The same enrichment of sodium happened in the experimental plant biomass at peat in comparison to plants at other substrates (Table).

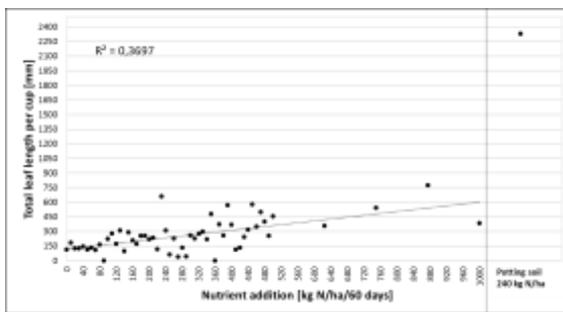


Figure: Total leaf length per cup, for *T. latifolia* with peat as substrate and additional leaf length of plants which are further grown at potting soil during the experimental period.

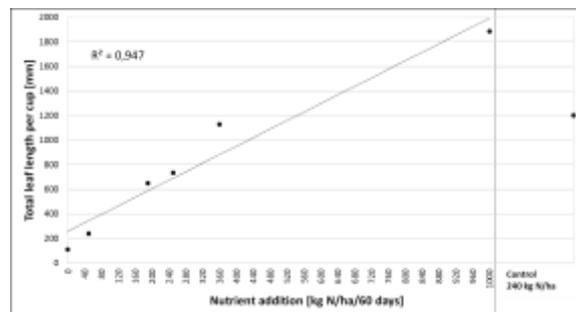


Figure: Total leaf length per cup, for *T. latifolia* with quartz sand as substrate and additional leaf length of plants from a control with potting soil.

Table: Sodium concentration in above ground biomass of *T. latifolia* at peat, potting soil and quartz sand and concentration in substrate at the beginning of experiments.

<i>T. latifolia</i>	Na-concentration ($\mu\text{mol/g TG}$)	
	Above ground biomass	Substrate
Peat	607 \pm 121,1	638,3
Potting soil	65,4	14,8
Quartz sand	26,8 \pm 7,8	0,0

The total leaf length was measured as an indicator for biomass production and plant vitality. *T. latifolia* shows a positive dependency of increasing biomass production on increasing nutrient addition, only for quartz sand. Because of the small number of experimental plants and the missing number of repetitions, it is not possible to statistically prove the data. The results for *T. latifolia* on peat made clear, that plants in comparison with potting soil and quartz sand show a very poor growth

During the experiment it became clear, that some other factor than the nutrient availability was negatively influencing plant growth. It was not possible to narrow down the amount of N (and also of P and K) at which the plants show a growth optimum.

A high Na-concentration in soil reduces plant growth and also changes soil properties (Figure below, left), which leads to a lower permeability for water and air (Bernstein, 1975; Blumwald et al., 2000). On a long-term basis, the plants struggle for nutrients and it is possible that they experienced N deficiency. That is contradictory with

the partly high N additions within the N gradient, but all symptoms (Figure below, right) argue for such a deficiency. To summarize the final result, NaOH was most likely the reason for the arising problems.



Figure: Illustration of changing soil properties from peat without NaOH to peat with NaOH.

Figure: Illustration of reduced plant growth from the start (on the left) until the end (on the right) for a plant on peat.

Sources:

- Bernstein, L. (1975). Effects of salinity and sodicity on plant growth. *Annual Review of Phytopathology*, 13, 295–312.
- Blumwald, E., Aharon, G. S. & Apse, M. P. (2000). Sodium transport in plant cells. *Biochimica et Biophysica Acta*, 1465, 140–151.
- Hoagland, D. R. & Arnon, D. I. (1950). The water-culture method for growing plants without soil. *Calif. Agricult. Exper. Station*, 347, 1-32.

News from Nijmegen

Jeroen Geurts

I finally talked to a representative of the Netherlands Enterprise Agency (RVO). They are dealing with subsidies from agriculture and the interpretation of European legislation. The man I talked to is not the decision maker, but an advisor/specialist at this agency. He already knew about wet agriculture initiatives and was especially interested in clean water in agricultural peatland areas. About the direct payments he said that paludiculture can get the normal payment of 350 euro/ha. It only needs to be agricultural land where you grow something you can harvest. It doesn't have to be an official agricultural crop. Turning permanent grasslands into paludiculture is also not a problem, he said, because there are no restrictions on that in the Netherlands at the moment. They even convert grassland into corn fields at the moment. It is only important to keep a minimum area of permanent grasslands per country. Apparently we are far above this threshold in the Netherlands. The last important thing he mentioned, was that farmer organizations could possibly also apply for a water purification subsidy from RDP3 (if water purification by paludiculture is proven of course), together with interested water authorities. 50% of the money can come from RDP (Rural development program) and 50% has to come from the water authority (Dutch website of RDP/POP3: www.rvo.nl/onderwerpen/agrarisch-ondernemen/gemeenschappelijk-landbouwbeleid/plattelandsontwikkeling).

All of the above is only valid for the Dutch situation and also not an official statement of RVO. The advisor suggested that farmers should just apply for a subsidy at RVO and see what happens. At least we keep in touch with this organisation. They are certainly willing to collaborate with us. The main problem they see with paludiculture are the high harvesting costs, because special machinery is needed. In the meanwhile, RVO told me that policy makers in The Hague will organize a brainstorm session about paludiculture with *Typha*, possible subsidies and crop recognition. They still need and ask for cost and revenue calculations. So it is important that we can provide them with some financial input concerning *Typha* cultivation as soon as possible, because it has their attention now.

Climate strategy for the agricultural sector

Jan Peters, Wendelin Wichtmann

Right at the beginning of the new year (10th of January) the mainstream national German farmers association, Deutscher Bauernverband (DBV), launched its climate strategy. The paper also considers peatlands: On the one hand, rewetting of drained agriculturally used peatlands for climate protection reasons is regarded as an intervention that strongly conflicts with existing ownership and production conditions. Rewetting for nature conservation purposes is considered unacceptable. On the other hand the strategy says that „economic use alternatives“ with adapted water management must be found, but that these alternatives are still under development and in a pilot stage. The strategy calls for more research to develop strategies to continue economic use of land after rewetting. The strategy notes that it is necessary that agricultural policy recognizes paludiculture as a type of agriculture to ensure economic viability. Incentive programs, utilisation and marketing strategies, as well as markets must be developed for products from wet peatlands such as sedges, cattail and mosses. In pilot and demonstration projects, practical procedures for managing wet areas should be developed and disseminated through education and training. In any case, research is required to develop strategies for making intensive agricultural use compatible with rewetting, for instance by adapted water management. So the Bauernverband seems to be on the right way, although they do not yet appear to be very convinced about the role of peatlands in the climate discussion. We still need further projects and actions to win farmers as active partners for climate change mitigation and adaptation by peatland rewetting and paludiculture.

More information: www.bauernverband.de/klimastrategie-2018.

News from other projects and activities

Morgen project at the GMC starts by January 2018

Wendelin Wichtmann

Within this project, relations between the city of Greifswald and surrounding areas for the production of biomass in paludiculture and their utilization (energetic: heat; material: e.g. insulating materials) shall be established and consolidated. The approach brings together key stakeholders to develop and sharpen a common goal for rewetting and subsequent paludiculture. The target group includes land owners and other decision-makers who have any influence on the land use and water level on fen peatland areas (and biomass recycling). The project comprises the following sub-areas:

- Development of proposals and scenarios for the conversion to sustainable agricultural use of fen peatlands
- Identification and increase of the acceptance of measures in the peatland area (rewetting/ Paludiculture), including through exam days and workshops
- Formulation of recommendations for the concrete implementation of Paludiculture
- Development of Project ideas/applications for the area-specific implementation ☒ Participation procedures for regional energy supply (Heat/biomass)

In this project, the Michael Succow Foundation (Thomas Beil, Wendelin Wichtmann) cooperates with the chair of landscape economy (Prof. Volker Beckmann, Dr. Michael Rühls) and the city of Greifswald. One of the first activities is an assessment of GHG emissions from peatlands belonging to Greifswald (John Couwenberg and Felix Reichelt). The project is still looking for somebody to be employed at the project for covering the peatland related activities at the Michael Succow foundation.

Conferences and workshops

Conference: “Thermal conversion of herbaceous biomass” in Ringsheim, Germany, 14th of December 2017 organized by Fachagentur Nachwachsende Rohstoffe e. V. and Zweckverband Abfallwirtschaft Kahleberg

Claudia Oehmke

On the Conference producers of heating systems, biomass conditioning companies, agricultural scientists and engineers, authorities from the energy sector and environment as well as project executing organisations came together to discuss the development and constraints of conversion techniques for herbaceous biomass in Germany. The climate protection goals require a 15% reduction of CO₂ until 2020 and 90% CO₂ until 2050. The use of biomass for heating plays an important role in gaining these goals for climate protection. Besides the wood sector where resources are also limited, the importance of herbaceous biomass will increase in the next decades.

Currently, the use of herbaceous (gramineous, stalk material e.g. hay, straw) biomass for heating is not widely practised in Germany, unlike in other countries of Europe, for example Sweden and Denmark. Reasons for the slow development seem to be e.g. difficulties for continuous biomass supply. As well a keen competition with wood as a biofuel is present. Wood is comparable famous, technologically easier to handle and plants are cheaper to install. Given that a special boiler technology is needed for herbaceous fuels 10-15% more investment costs arise, in comparison to wood technologies. In Germany, the requirements for herbaceous heating plants are more strict than for wood heating plants according to the Federal Emission Protection Directive (BImSchV) and the Technical Instructions on Air Quality Control (TA Luft). Last year, a new draft (TA Luft) has been worked out to include recommended limits of the MCP-Directive of the EU from 2015. But the draft showed much lower emission limits f.e. for 0.1-50 MW heating plants (0.1-15 MW fine dust 20 mg/Nm³, NO_x 0.30 g/Nm³, CO 0.15 g/Nm³) as is given by the EU, that further hindered the utilization of herbaceous biomass for heat generation.

Especially scientific engineers and boiler producers are on the opinion that even the newest technologies are not able to cope with the proposed low emission limits. On one side it will take another years to develop the technologies further, associated with higher costs for new combustion technology than today. Some participants were also interested in small scale heating plants for private use, especially farmers that have straw as a combined product from their grain production. But the common emission policy in Germany not allows an economically feasible production of heat with small scale boilers.



Fig.: Automatic fuel supply at the heating plant 980 kW in Ringsheim, Southern Germany. Bales are made from hay harvested on mountain grass meadows nearby. In future there should be plenty of these plants in place for utilisation of biomass from rewetted peatlands.

Besides that a company that provides pellet plants said that biomass supply in their location are worthwhile, but the sales market does not exist yet. This is why this company mostly works as contractor and pelletizes farmers' biomass, that will be used on their farms afterwards for heating in small scale pellet boilers.

Finally, lots of the participants concluded that also the ministries and the government are responsible to decide, in which way the renewable energy market will develop. To make it easier to promote herbaceous biomasses as renewable energy sources, lower emission limits, as well as governmental support for heating plant operators could be a way.

Paludiculture UK – Workshop in Kendal, Cumbria (29th & 30th November 2017)

Sabine Wichmann

An inaugural workshop on paludiculture in the UK was organised by Natural England and the Cumbria Wildlife Trust with support of the IUCN UK Peatland Programme. Two days of presentations, workshops, a social evening and a field trip attracted about 50 participants from all over the country, encompassing stakeholders from government, environmental non-government organisations, academia, peat industry and agriculture.

The first day started with Emma Goodyer from the IUCN UK Peatland programme giving a short insight in current developments in the UK as overcoming the neglect of fens compared to bogs, an enquiry on challenges & barriers around paludiculture and a round table on horticultural peat. Three keynotes from Germany were invited: Greta Gaudig (Greifswald Mire Centre) spoke about the importance of peatlands for the global climate. Sabine Wichmann (Greifswald Mire Centre) introduced the concept of paludiculture and presented various examples of the productive use of rewetted fens. Silke Kumar (peat company MOKURA) shared the experiences of Sphagnum farming on rewetted bogs for replacing peat in horticulture. "Grasgoed", an interesting Interreg project turning grass cuttings from conservation management into viable products, was presented by Belgian colleagues (Katrien Wijns, Chris Dictus). Jack Clough (University of East London) used GIS data to identify areas suitable for paludiculture case studies in Cumbria, e.g. as buffer zones for conservation areas of lowland peatlands. Deborah Land (Natural England) introduced to the Cumbria Paludiculture Pilot Project that will include the establishment of a Sphagnum farming trial on a cut-over bog.

In the afternoon, four interactive workshops allowed to discuss challenges, incentives and opportunities of implementing paludiculture in the UK regarding policy, financial aspects, practical aspects, and ecosystem services. Despite of all the problems connected to the Brexit, it is seen as unique opportunity to get rid of the Common Agricultural Policy and to allocate public money to the provision of public goods and services.



Fig.: Field trip to the Lyth Valley to discuss perspectives of "wet agriculture" (photo: Sabine Wichmann)

The fieldtrip to Foulshaw Moss Nature Reserve and the Lyth Valley was blessed with sun & light frost – certainly the best weather you can have end of November at the edge of the Lake District, one of the wettest parts of England. Serious flooding in recent years, high pumping costs and landowners' need to make a living on their land set the ground for discussing perspectives of “wet agriculture” in the Lyth valley. However, after peat-cutting and drainage little is left to be called peatland. Peat remained only in one third of the area, i.e. in rewetted nature reserves and as a thin layer of few centimetres under grassland. This case illustrated the importance of a clear wording: “Paludiculture” may be a cumbersome term in first place, but defined as “the productive use of wet and rewetted peatlands under conditions that maintain the peat body and minimise GHG emissions” the term cannot be replaced by a vague wording as “wet agriculture” or “swamp farming”.



Fig.: Participants at the paludiculture workshop in Kendal/North West England
(photo: <http://www.cumbriawildlifetrust.org.uk/news/2017/12/04/making-boggy-land-pay>)

Workshop „Setting the course for EU policies on peatland climate mitigation“ in Brussels



This workshop was organized as a joint activity of the two projects funded by FACCE JPI, Climate smart agriculture, the CAOS project (Thünen Institute Braunschweig) and the Cinderella project (Greifswald University, GMC). About 45 stakeholders participated in this workshop, they represented several NGOs, DG's from comission, farmers representatives, as well as different levels of national administration. The outcomes are unclear and need further interpretation, some more detailed analysis will be prepared until the end of the project.

In general we could intensify the cooperation with the Thünen Institute and we reached some stakeholders, who until now were not aware at all about the potential climate impact of peatlands and and who might include peatland issues in further decisions. On the other hand some participants (esp. representatives from farmers organisations) still want to feed the world from drained based agriculture on peatlands. Still it will be a great task for the next decades to intensify cooperation with these people to come to a common understanding on rewetting and implementation of paludiculture.

Upcoming conferences

4th International Conference on Water Resources and Wetlands

Anybody who is interested is invited to participate in WRW2018 – 4th International Conference on Water Resources and Wetlands which will be held on 5th - 9th of September 2018 at the Hotel Delta in Tulcea (Romania). The conference is organized by the Romanian Limnogeographical Association (RLA) in collaboration with the German Limnological Society (GLS), Polish Limnological Society (PLS), Danube Delta National Institute Tulcea (DDNI) and the Danube Delta Biosphere Reserve Authority (DDBRA). The deadline for Registration and Abstract Submission – 30th of January 2018: <http://www.limnology.ro/wrw2018/abstract.html>

Authors are kindly asked to submit original manuscripts (in electronic form). All accepted papers will be published in conference proceedings (ISSN 2285-7923) and submitted for evaluation and indexation to ISI Web of Science Clarivate Analytics, SCOPUS, EBSCO, Google Scholar, CNKI (WRW 2014 it is indexed in ISI Web of Science Clarivate Analytics and WRW 2016 is under evaluation). Please help to promote the conference.

Save the date



WETPOL 2019, 8th International Symposium on Wetland Pollutant Dynamics and Control, June 17th -21th, 2019, organized by Hans Brix and Carlos Arias, Aarhus University, Denmark

WETSCAPES CONFERENCE



Understanding the ecology of restored fen peatlands for protection and sustainable use to be held on September, 10th to 13th, 2019 in Rostock, Germany (www.wetscapes.de/conference/).

IMCG bulletin October/November 2017

The latest bulletin by IMCG recently has been published recently. Again, it provides several information on project related relevant issues and gives an overview on recently published papers on peatland protection: <http://www.imcg.net/>. Here you also find a current overview on newest publications on peatland related stuff. The following issue (December 2017) will be provided next days.

Mires and Peat

The latest volume (Vol. 20) of Mires and Peat: <http://mires-and-peat.net> dealing with “Growing Sphagnum” has been updated recently. Now 8 articles are online. A special volume based on the RRR2017 conference will be published within first half of 2018. Nine manuscripts have been submitted.