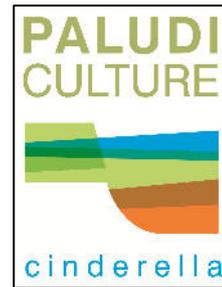


CINDERELLA - Update IX

15th of October 2016 (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”



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.).

Short reports on Conferences and workshops

The 5th international EcoSummit 2016, Montpellier, 29th of August to 1st of September

More than 1,600 experts gathered end of August in Montpellier in Southern France for the 5th international EcoSummit. Aim was to exchange and discuss latest scientific insights in global ecological issues. The Conference was hosted by the French National Institute for Agricultural Research (INRA) and the Institute de Recherche pour le Développement (IRD). The organisation had been facilitated by the international science publisher ELSEVIER. Many of the presentations dealt with wetlands, ecosystem services and nutrient cycling. Unfortunately, some of the keynotes were disappointing. The general impression at the end was that others also only put on their trousers one leg at a time.

The Cinderella project took the chance together with Gerald Jurasinski from Rostock University to arrange and moderate a double session on peatland rewetting, greenhouse gas emissions, and paludiculture. In total six representatives from the CINDERELLA project contributed to this session as well as to the extra paludiculture workshop that was held the other day, and to the poster sessions of the conference. The international attention is increasing for management approaches that deal with degraded peatland sites that on the one hand mitigate negative impacts of former drainage based peatland utilisation, like land subsidence and greenhouse gas emissions, and safeguard productive sites for human welfare and on the other hand hold back nutrients in the landscape. Representatives of CINDERELLA partners shaped most of the active part of the Paludiculture-session. The presentations can be found on the project dropbox (\Dropbox\CINDERELLA-Partners\Ecosummit Montpellier 2016\presentations_ecosummit). In total around 40 scientists from several different countries attended the session and the workshop and stimulated to intensify global networking in Paludiculture issues and to increase knowledge transfer between existing paludiculture research and implementation initiatives. The notes to the workshop can also be found on the project dropbox. A questionnaire was developed (see also on the dropbox) that will be sent to the participants of the

workshop and could be a first step for an international network on paludiculture. Please make proposals for optimization!



Figure: During the round table workshop on paludiculture 31.8.2016 in Montpellier (L. Lamers)

Several excursions were offered. One of them led into the Greater Carmargue – the delta area of the river Rhone and one of the greatest western European wetlands, about 100 km east to Montpellier. It turned out that most of the delta area nowadays shows an artificial hydrology as the branches of the river Rhone are channelized between dikes. The Carmargue is dominated by irrigation based agriculture and only some small areas are artificially irrigated by pumping and flooding for 1-2 months a year to keep their “wetland character”.



Figure: Left: A “pond” dominated by a *Bolboschoenus maritima* reed, grazed and totally dried out
Right: *Salicornia* dominated “wetland” (Tour du Valat; W. Wichtmann)

In total the EcoSummit was a good chance for an intermediate Cinderella project meeting and gave opportunities for exchanging on recent project activities.

Ecohydrology Demonstration Sites

Sabine Wichmann calls attention to a Keynote-talk in Montpellier which presented "Ecohydrology Demonstration Sites" from the "International Hydrological Programme" of the UNESCO. It would be great, if concrete examples for Paludiculture-would be proposed by all CINDERELLA project partners to get some international or at least global awareness by support of UNESCO. Here are links to their homepage about minimum criteria for the establishment of new ecohydrology demonstration sites (<http://ecohydrology-ihp.org/demosites/candidate/info/>) and a description on application procedures: <http://ecohydrology-ihp.org/demosites/candidate/form?approved=true>

Conference on “Problems of rationale utilization of natural resources and sustainable development of Polesie region”, Minsk, 14th -17th of September 2016 (Annett Thiele)

The international conference ‘Problems of rationale utilization of natural resources and sustainable development of Polesie region’ has been held in Minsk, Belarus from the 14th -17th of September 2016. Around 300 participants from at least five countries (Russia, Belarus, Poland, Ukraine, Germany) discussed the current problems of drained peatland utilization and possible ways of sustainable use of drained and rewetted peatlands. The Russian colleagues from Tver University presented recent results of trials for reed establishment on rewetted peatlands in Tver Oblast. Colleagues from the international Saharov state ecological institute Minsk handed in an abstract on Paludiculture in Grodno region, presenting the results of the EU AID project “Wetland Energy” on reed cutting and pellet production from peatland biomass.

One of the excursions headed to the ‘Polesie experimental station of meliorative landuse and grassland cultures’ presenting the long term peat loss rates from the year of reclamation and latest results on the preservation of shallow peat layers used in the German Sanddeckkultur. Besides Paludiculture, the Sanddeckkultur is propagated to be a peat conserving land use system. A four-year experiment showed that the remaining peat of about 30 cm seems not to have lost any carbon while being covered with sand and grassland. Follow up studies on GHG emissions and carbon fluxes in water and soil would be highly appreciated by the colleagues from the Institute for Nature Use of the National Academy of Sciences Minsk.



Figures: Prof. N.N. Bambalov showing peat loss in a Polesie fen drained in 1961 (steel gauge marks the original soil surface; left). Analysing the profile of Sanddeckkultur experiment from 2012 (right, photos Annett Thiele).



Figure: Sanddeckkultur: A shallow peat layer covered by sandy soil. It seems that the organic material remained without structural C losses according to the investigations results (Annett Thiele)

IPS conference, 15th – 19th of August 2016, Sarawak, Malaysia (Susanne Abel)

The 15th International Peat Congress took place from August 15th to 19th in Kuching, Malaysia, organised by the International Peatland Society (IPS). Impressive, because it was the largest such congress ever and the first one organised outside Europe or North-America. Impressive also by the way the local organisers managed to abuse the international arena for crude, primitive, but locally effective propaganda (see more in the Bulletins of the International Mire Conservation Group, August and September 2016: <http://www.imcg.net/pages/publications/bulletin.php>).

IMCG field Symposium in Malaysia and Brunei 19th to 28th of August 2016

The IMCG field symposium organized by the Global Environmental Centre started right after the IPC for a 10 day excursion through Malaysia (Sarawak, Sabah and Peninsula Malaysia) and Brunei. 30 peatland enthusiasts from different countries joined the trip. See also further in the IMCG-Bulletins.

International workshop on "Restoration of peatlands in Russia: project outcomes and cooperation perspectives" held on September 27th -28th in Vladimir and Meshera National Park (Jan Peters)

The international workshop in Vladimir (Russia), organized by Wetlands International together with Michael Succow Foundation and Greifswald University, both partner in the Greifswald Mire Centre, gave insights into peatland management, conservation, and restoration in Russia and worldwide. Participants were made aware of outcomes of the Russian-German cooperation project "Restoring peatlands in Russia – for fire prevention and climate change mitigation" that were obtained in 2012–2016 and then discussed follow-up priorities of peatland restoration, conservation, and wise use activities that facilitate mitigation of and adaptation to climate change.

The 110 participants came from 14 administrative regions of Russia and 6 foreign countries. They represented executive authorities of various level, federal specially protected natural areas, scientific community and educational institutions, private sector, and non-governmental non-profit organizations.

The project has introduced innovative technologies for ecological rewetting of disturbed peatlands that increasingly become more popular in Russia. In the course of Project implementation, model rewetting activities were carried out on an area of over 30,000 ha in the Moscow, Vladimir, Nizhny Novgorod, and Tver provinces. Monitoring activities and assessments of rewetting effectiveness in terms of fire prevention and climate change mitigation were carried out on over 70,000 ha in the Moscow Province. The Vladimir Province Administration that hosted the workshop in association with the Project, identified priority sites for rewetting cutover peatland deposits. Plans of these works were included in the provincial environment conservation programme.

Peatland restoration aspects were vigorously discussed at the workshop in the form of interactive seminars, in particular rewetting methodology, socio-economic issues, paludiculture, legislation, scientific grounding of engineering projects, monitoring of rewetting results, economic incentives, capacity building, education and awareness raising. A specialized seminar on "Voluntary carbon markets: possibilities and perspectives for Russia" was held during the workshop. Speeches of foreign experts on restoration and wise use of peatlands, including paludiculture development and sustainable use of peatlands, with case studies from Germany, Belarus, the Netherlands and other countries, raised great interest among the participants.

Special attention was given to the selection of technologies and other practical problems that were put forward by experts during their excursion to rewetting sites in the Meshera National Park. Participants from other Russia's regions expressed their interest in the rewetting activities on disturbed peatlands. Possible cooperation with private sector investors was discussed. In the course of the workshop, technological guidelines and other materials were presented to the participants.



Figure: Anna Vozbrannaya from National Park administration explaining peatland ecosystems in Mesherea National Park, Vladimir Voblast (Jan Peters)

Field congress on wet crop cultivation (30th of September 2016 at the Veenweiden Innovatiecentrum (VIC), Zegveld, The Netherlands (Jereon Geurts)

The first field congress on wet crop cultivation in the peat meadow area was held on the 30th of September 2016 at the Veenweiden Innovatiecentrum (VIC), Zegveld, The Netherlands. It was organized by the VIC, STOWA (Applied Research on Water Management), Radboud University, the province of Utrecht and the Louis Bolk Institute. Aim of this day was to share knowledge and to show and discuss the cultivation of wet crops in relation to soil subsidence, ecosystem services, sustainability, possible applications and economic profitability. The focus was on cattail, cranberry, peat moss, and Azolla. These are all wet crops with enough perspectives to take sustainable agriculture to a next level, to create a solution for the high CO₂ emissions and soil subsidence rates, and to improve water quality and biodiversity. The more than 100 participants had different backgrounds: provinces, water authorities, municipalities, nature protection organizations, farmers, consultancies, research institutes). Please find the report on the project dropbox (\Documents\Dropbox\CINDERELLA-Partners\reports of partners).

Professor Leon Lamers (Radboud University) gave a scientific introduction about wet crop cultivation, paludiculture and ecosystem services in peat meadow areas. He stressed the importance of rewetting and paludiculture for the production of clean water, food and biomass, but also for providing supporting, regulating and cultural ecosystem services. This means for example biodiversity, climate regulation, and education. Nature and production are not counteracting, but they are just on opposite sides of a gradual scale between 100% nature and 100% production. Wet crop cultivation should be somewhere on this gradual scale. Profitability calculations of wet crops should be partly based on market incomes and partly on ecosystem services.

In the afternoon people could visit stands and experimental fields with all 4 wet crop species. Besides that there was the option to visit an experimental field with wild rice, *Miscanthus* and willow. The presentations also focused on possible applications, economic profitability, and ecosystem services.

Cranberry (*Vaccinium*) can be used for human consumption. The most important costs are maintenance costs for weed management. Different forms of weed management were demonstrated (mechanical, biological, chemical). The market for cranberries is quite small. The cultivation contributes to a lesser extent to ecosystem services.

Cattail (*Typha*) can be used for making construction material and isolation, fodder, energy production, and even for human consumption. Ecosystem services will have important benefits from cattail cultivation, especially water storage, water purification, lower CO₂ emissions and land subsidence.

Water fern (*Azolla*) grows very fast and can be used for protein-rich fodder, and even for human consumption in the future. *Azolla* can take up a lot of phosphorus from the surface water and a lot of nutrients can be removed by harvesting. Water storage is another important ecosystem service.

Peat moss (*Sphagnum*) can be used for decoration material and sustainable potting soil. *Sphagnum* cultivation will stop peat subsidence and lower or stop CO₂ emissions.

In the final discussion between stakeholders, the delegate of the farmer organization stressed that it is logical that agriculture and nature have to work together to conserve the peat meadow area. The delegate of the water authority indicated that the water level should not always follow the function. Because of climate change, we have to think the other way around more often. The delegate of the policy makers mentioned that the peat meadow area is an important economic area that has to be conserved. They all agreed to develop a joint agenda and knowledge program to introduce wet crops in the peat meadow area, focusing on substantive questions, solutions for practical constraints, and profitability calculations. The second field congress on this topic will be held in September 2017.

Upcoming conference

Greifswald - Preparation of the 2nd reed conference (rrr2017)

Some of you will remember our rrr conference which was rather successfully held in Greifswald, February 2013 (<http://www.paludiculture.uni-greifswald.de/en/projekte/rrr2013/index.php>). Although the budget for this had been cancelled within the CINDERELLA project by the German funding agency, we are planning to organize the follow up conference in late summer 2017 (26th to 28th). The first announcement to this second international conference (www.rrr2017.com) on reed as a renewable resource in Greifswald now is on the way. Please save the date! More information will be provided. Before the international conference, a national workshop will take place which highlights the restoration and paludiculture activities in the 'peatland rich' federal states of Germany (25th of September, in German). Subsequently there will be field excursions (26th). The international conference will be completed by a sphagnum workshop (28th afternoon) including a field excursion to Lower Saxony the next day (29th of September).

News from CINDERELLA Project partners

Activities in Halmstad (Stefan Weisner)

A student (Ross Barker) has been working for the Halmstad team during the first part of this year. He focused on hydrological aspects of the rewetting potential of drained peat soils in southwest Sweden and produced a report. You can find the “study of potential sites for a new nitrogen removing CINDERELLA wetland in the Halmstad area of Sweden” on the dropbox: \Dropbox\CINDERELLA-Partners\reports of partners\RB report.pdf

The interviews of landowners having substantial areas with agriculture on drained peat soils have been finished and the data will be analysed when Anna Hansson is back from maternal leave.

Three wetlands on the experimental wetland area (EWA) dominated by *Phragmites* have now been harvested in June and September in 2015 as well as in 2016. Three additional *Phragmites*-dominated wetlands are harvested in autumn/winter only. Biomass and biogas yield will be compared between these two treatments. Further comparison will be done for the assessment of nitrogen removal from the water flowing through these wetlands.

Activities in Nijmegen (Jeroen Geurts)

On the 7th of October, an expert meeting on peat bog restoration and ecosystem services was held in Heusden (The Netherlands). The meeting was organized by the province of Noord-Brabant and the Bargerveen foundation. The 65 participants came from different organizations (nature protection agencies, water authorities, provinces, farmer organizations, research institutes, residents).

Prof Hans Joosten (Greifswald University) talked about the current status of peat bogs on a global scale in relation to climate warming, drainage and peat fires. In that respect, local restoration projects in the Peel are rather small, but nevertheless very important.

Dr. Gert-Jan van Duinen (Bargerveen foundation) talked about the ecosystem services of peat bogs. Active peat bogs sequester CO₂ and their wet buffer zones offer chances for paludiculture. But peat bog areas also provide ecosystem services, such as water storage, water purification and recreation.

Dr. Christian Fritz (Radboud University) talked about the bio-economics of paludiculture. He showed the possible applications and profitability calculations of peat moss, cattail and reed cultivation. He stressed that it is crucial to provide a good business case.

In the afternoon there were two excursions. In the Deurnsche Peel a future paludiculture pilot site of 5.5 ha was visited and explanation was given by park ranger Martin Carree. There was a demonstration of a wetland track harvesting the vegetation. Harvesting techniques were explained and potential biomass and nutrient removal figures were given. In the Groote Peel park ranger Sjaak Smits and manager Jeroen van Leijsen were telling about the rewetting measures within the peat bog restoration project LIFE+ Groote Peel.

During the discussion it was stressed that paludiculture is just a means to an end. This means that it can be a (temporary) solution to remove nutrients and finally make a site more suitable for nature development. The question also arose if areas with paludiculture should have the destination “agriculture” or “nature”. This is an important dilemma with respect to the legal aspects of

paludiculture. The conclusion of the expert meeting was that there are possibilities to restore peat bog areas when problems will be tackled on a system scale, including buffer zones.

Activities in Greifswald

In her master-thesis, Nora Köhn is dealing with the development of *Typha latifolia* and *Typha angustifolia*, at different nutrient supply conditions. Nitrogen gradients and different relationships between Nitrogen and Potassium are investigated.

About 300 cups have been planted with three plants each. Since 26th of September for 60 days, 2 times a week regular fertilising with nutrient solutions will take place. Depending on the development of plants, harvesting for laboratory analyses will be realised.

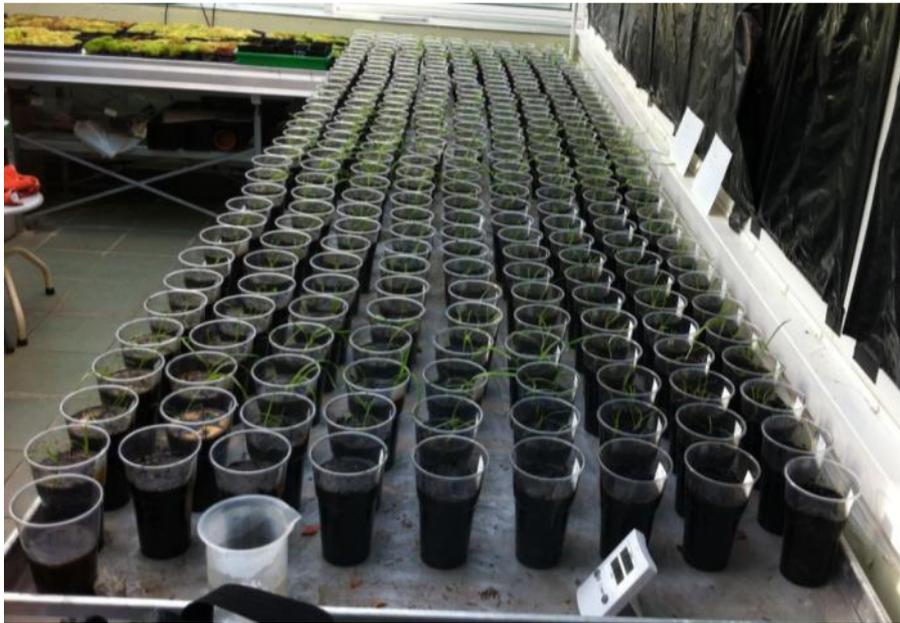


Figure: Setup of glasshouse tests with *Typha* seedling (Nora Köhn)

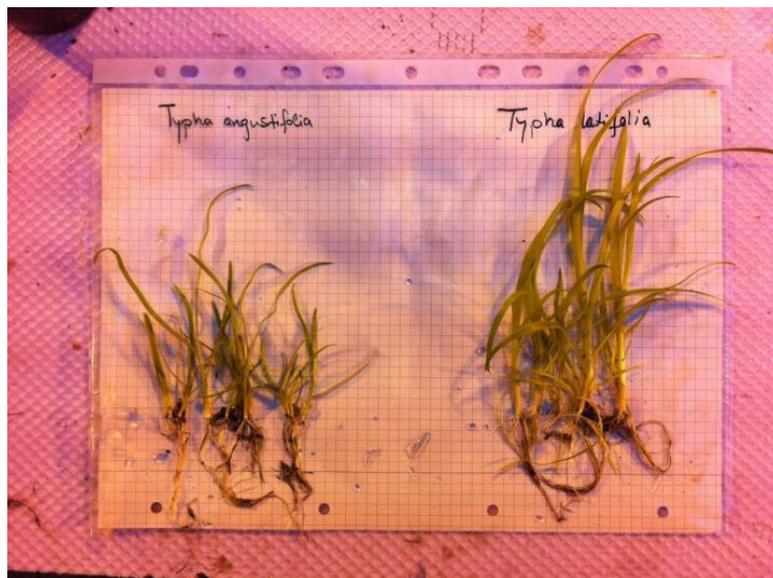


Figure: example for different development of *Typha* seedling from lab tests (Nora Köhn)

In September data on biomass productivity were taken in the CINDERELLA core field sites near Greifswald. In four treatments biomass plots have been harvested. The study will compare productivity and above-ground nutrients of *Typha latifolia* at three different harvest dates (September, July and February).



Figures: The investigation site Aalbude. Comparison of the situation after the dry summer with invasion of grasses (f.e. *Phalaris arundinacea*) on previously open inundated areas. The Aalbude investigation site in July (left) and September (right; Claudia Oehmke)

Nitrogen retention

The literature research study performed by Felix Reichelt concerning nitrogen retention is still ongoing. The most important question is, which factors are influencing N-retention and if any proxies are existing. He found a quite promising systematic review with appropriate data table, which is a good base for expanding. The figures below give a first overview of data structure and relationships between total N removal and hydraulic loading rates (HLR, Fig. 1, n = 146) or hydraulic retention time (HRT, Fig. 2, n = 5). The different number of observations (n) is due to gaps existing for particular variables in the dataset, which will (hopefully) be filled by further literature study. Unfortunately only rare N-retention measurements from (natural) peatlands or organic soils could be found at the moment, because most of research data available is about constructed wetlands. For more information please contact karl.felix.reichelt@posteo.de

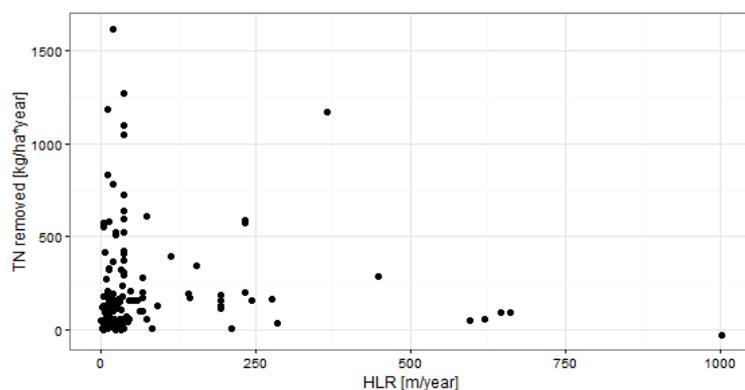


Figure 1: Relationship between total nitrogen (TN) removal and hydraulic loading rates (HLR) (n=146)

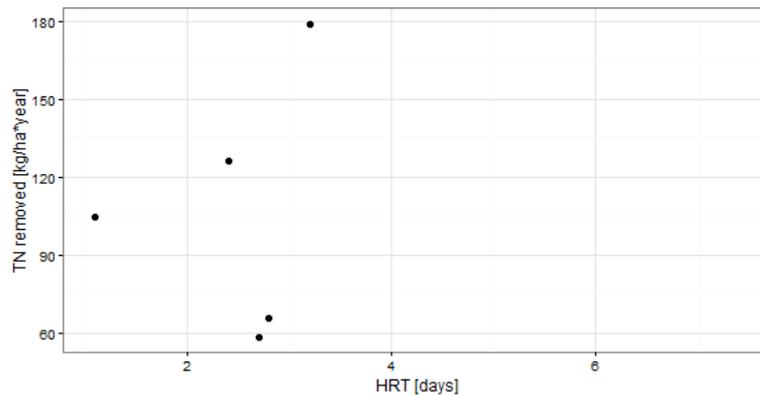


Figure 2: Relationship between total nitrogen removal and hydraulic retention time (HRT) (n=5 → due to incomplete variable HRT)

Some recent project relevant publications

Giannini, V., Oehmke, C., Silvestri, N., Wichtmann, W., Dragoni, F., Bonari, E. (2016): Combustibility of biomass from perennial crops cultivated on a rewetted Mediterranean peatland. *Ecological Engineering* 97, pp. 157 - 169.

Joosten H. & Wichtmann, W. (2016): Das Moor, ein vielfältiger Landschaftstyp unter Druck. *Aquaviva* 3/2016 p 1- 9

Wichtmann, W., Schröder, C & H. Joosten (2016): Nachhaltige Nutzung der Moore. *Aquaviva* 3/2016 p 20 – 21

Kundas, S. P., Wichtmann, W., Rodzkin, A.I., Sivogrov, O.V., Zalesky, I.P. (2016): Utilisation of wetland biomass in energy purposes. *Proceedings of the international scientific conference "Problems of rational use of natural resources and sustainable development of Polesie, Minsk 14. – 17.9.2016, Vol. 2, pp. 265 – 269*

Järveoja, J., Peichl, M., Maddison, M., Teemusk, A., & Mander, Ü. (2016): Full carbon and greenhouse gas balances of fertilized and nonfertilized reed canary grass cultivations on an abandoned peat extraction area in a dry year. *GCB Bioenergy*, Volume 8, Issue 5. September 2016, Pages 952–968

Karki, S., Elsgaard, L., Kandel, T. P., Lærke, P. E. (2016): Carbon balance of rewetted and drained peat soils used for biomass production: a mesocosm study. *GCB Bioenergy*. Volume 8, Issue 5, September 2016, Pages 969–980