



**FACCEJPI**

## **FACCE-JPI survey for project coordinators** **Valorisation of the FACCE-JPI results**

### Agriculture Food Security and Climate Change

The Joint Programming Initiative on Agriculture, Food Security and Climate Change (FACCE-JPI) aims to tackle the grand societal challenges of sustainable agricultural development and food security in the face of climate change that cannot be solved solely on the national level. Your project has been selected based on expected contributions to this major challenge.

FACCE has developed a valorisation strategy, with the aim to show impact on the global societal challenge, feed in to policy and evidence-based decision making. The first step in this valorisation strategy will be a series of workshops gathering together researchers and stakeholders and giving rise to policy and practice briefs. The first pilot workshop will be held early in 2017.

Therefore we ask you to answer this survey to help us to prepare valorisation workshops and highlight the key achievements of your projects under the FACCE-JPI umbrella.

#### **1. Project Information**

Project name: Climate-Smart Agriculture on Organic Soils (CAOS)  
Project coordinator: Dr. Bärbel Tiemeyer  
Project dates: 01/12/2015 to 30/11/2017

#### **2. Key scientific outcomes**

The project CAOS aims to generate the knowledge to design climate smart agricultural systems for organic soils adapted to the diverse regional conditions of Europe. Drought spells and extreme precipitation events are likely to increase in a changing climate and endanger the stability of agricultural production (Jentzsch *et al.*, 2007). Drainage fosters mineralization of organic soils (Maljanen *et al.*, 2010, Tiemeyer *et al.*, 2016) and deteriorates the soil (Zeitz & Veltz, 2002) and water (Tiemeyer & Kahle, 2014) quality. Due to subsidence, the remaining lifetime of such systems is limited by the rising sea water level and underlying low-quality soil layers (Erkens *et al.*, 2016). Organic soils are the hotspots of vulnerability, adaptation needs and GHG emissions from agriculture in temperate and boreal Europe (Lapveteläinen *et al.*, 2007; Nielsen *et al.*, 2012).

We propose that wet organic soils could be used as risk insurance in dry periods on farm or regional level, while water and soil management could prevent yield losses due to trafficability problems in wet conditions. CAOS will provide and distribute evidence that climate smart management improves yield stability and quality as well as resilience to climate change while providing strong GHG mitigation and improved soil and water quality. Study regions represent typical land use systems and unique challenges in six regions in Europe with a large share of organic soils drained for agriculture. In each study region, on-farm evidence of past climate smart management is synthesized, including farm surveys and expert knowledge. In four study regions, we are conducting field experiments with innovative climate smart management options comprising active water management (van den Akker *et al.*, 2012), soil management (sand addition) (Berglund & Berglund, 2016), and wetness-tolerant species for bioenergy use (Kandel *et al.*, 2013).

Cross-cutting for all study regions, we have gathered and analyze data on agro-economy, biomass quantity and quality, soil quality (Piayda *et al.*, 2016), water management, and water levels to derive indicators for a climate smart implementation of water and soil management. Process-based modeling is used to synthesize the data and to evaluate the adaptation through soil and water management under a changing climate. We will also perform scenario analysis of climate change risk abatement compared to unregulated drainage, analyze costs and test various policy instruments to support the future implementation of climate smart management of organic soils. Stakeholders are involved in bi-directional manner as regional partners, by workshops and questionnaires, and results will be disseminated widely to the scientific community, practitioners, decision makers, media and the general public.

## References

- Berglund, Ö. & Berglund, K. (2016): CO<sub>2</sub> emissions from cultivated peat soil with sand addition, a CAOS project. Poster at: 15<sup>th</sup> International Peat Congress, Kuching, Sarawak, Malaysia (15.-19.08.2016). Abstract No: A-038, p. 292–295.
- Erkens, G., van der Meulen, M.J., Middelkoop, H., (2016): Double trouble: subsidence and CO<sub>2</sub> respiration due to 1,000 years of Dutch coastal peatlands cultivation. *Hydrogeology Journal* 24, 551–568.
- Jentsch, A., Kreyling, J., Beierkuhnlein, C., and Jenuch, A (2007): A new generation of climate-change experiments: events, not trends. *Frontiers in Ecology and the Environment* 5, 365–374.
- Kandel, T.P., R. Gislum, U. Jørgensen, and Lærke, P.E. (2013): Prediction of biogas yield and its kinetics of reed canary grass biomass by near infra-red (NIR) spectroscopy. *Bioresource Technology* 146, 282–287.
- Lapveteläinen, T., Regina, K., and Perälä, P. (2007): Peat based emissions in Finland's national greenhouse gas inventory. *Boreal Environment Research* 12, 225–236.
- Maljanen, M., Sigurdsson, B.D., Guðmundsson, J., Óskarsson, H., Huttunen, J.T., and Martikainen, P.J. (2010): Greenhouse gas balances of managed peatlands in the Nordic countries – present knowledge and gaps. *Biogeosciences* 7, 2711–2738.
- Nielsen, O.-K. et multi al. (2012): Denmark's National Inventory Report 2012. Emission Inventories 1990-2010. Submitted under the United Nations Framework Convention on Climate Change and Kyoto Protocol. Aarhus University, DCE-Danish Centre for Environment and Energy, 1168 pp. Scientific Report from DCE-Danish Centre for Environment and Energy No. 19.
- Piayda, A., Tiemeyer, B., Bechtold, M., and Dettmann, U. (2016): Past management influences on the properties of organic soils. Poster at: 5th International EcoSummit 'Ecological Sustainability - Engineering Change', Montpellier, France (29.08.-01.09.2016).
- Tiemeyer, B. & Kahle, P. (2014): Nitrogen and dissolved organic carbon (DOC) losses from an artificially drained grassland on organic soils. *Biogeosciences* 11, 4123–4137.
- Tiemeyer, B. et multi al. (2016): High emissions of greenhouse gases from grasslands on peat and other organic soils. *Global Change Biology*, doi: 10.1111/gcb.13303
- Van den Akker, J.J.H., Hendriks, R.F.A., and Pleijter, M. (2012): CO<sub>2</sub> emissions from peat soils in agricultural use: calculation and prevention. *Agrociencia* 16(3), 43-50.
- Zeitz, J. & Veltz, S. (2002): Soil properties of drained and rewetted fen soils. *Journal of Plant Nutrition and Soil Science* 165, 618-626.

## 3. Key policy relevant findings /outputs

FACCE is providing research that can potentially feed into several European and international policies:

- The forthcoming European Food and Nutrition Security Strategy – Food 2030
- The European Bioeconomy Strategy (published in 2012 and will be reviewed and updated by 2017)
- The EU Climate and energy package action and COP21 follow-up
- The Common Agricultural Policy (CAP) and CAP 2020+

3.1. To which policy do you expect your results are/can be relevant? How could they contribute into this particular policy (ies). Please provide as much detail as possible.

### The EU Climate and energy package action and COP21 follow-up

The project's results will be relevant for the development and evaluation of mitigation strategies especially in the LULUCF sector, the analysis of policy option and identification of potential caveats.

In the partner countries, GHG emissions from organic soils are a major contribution to the GHG budget from agricultural activities, and need to be targeted to reach the EU emission reduction targets. As part of

the non-emission trading sector, agriculture should contribute to reducing GHG emissions by 16% in 2005-2020. This includes N<sub>2</sub>O from farmed organic soils. The EU Decision No 529/2013/EU (European Parliament and Council, 2013) sets accounting rules on greenhouse gas emissions and removals resulting from activities relating to land use, land-use change and forestry (LULUCF), including “cropland management”, “grazing land management” and “wetland drainage and re-wetting, which refers to CO<sub>2</sub> and CH<sub>4</sub> from farmed organic soils. The member states will need to report on plans for mitigation measures and report progress in accomplishing the planned measures. In this context, CAOS will offer scientific and practical evidence basis to implement activities for GHG mitigation on hotspot areas in the short term and will provide the scientific basis towards climate smart management including both adaptation and mitigation.

For example in Finland, a new law on climate came to force in Finland in 2015 resulting from the requirements of international commitments including the EU Climate and energy package. It determines e.g. that a climate plans need to be prepared for all sectors. Organic soils are the key target for mitigation actions in Finland and thus many measures in the climate plan which are now being prepared are related to organic soils. The field experiment in Finland was established to explore the possibilities of controlled drainage with raised ground water table to mitigate GHG emissions. The climate plan for agriculture now mentions both controlled drainage and paludiculture as potential ways of reducing the environmental impact of cultivated peat soils. At the same time, an update of the national energy and climate strategy is under preparation. The strategies for agriculture and LULUCF sectors are strongly based on the estimates of the efficiency and costs of measures for cultivated peat soils provided by the Natural Resources Institute Finland (Luke). Controlled drainage and paludiculture are part of the strategies selected for these sectors.

### **Common Agricultural Policy (CAP) and CAP 2020+**

The project’s results will be highly relevant to develop options to integrate mitigation options for agriculturally used options in the Common Agricultural Policy after 2020.

The task “Policy Analysis” within the work package “Agro-economic evidence of climate smart farming under different political conditions” of our project is specifically designed to evaluate options to integrate climate-smart management of organic soils into the CAP. The policy analysis comprises the potential support of adapted management by the CAP and the potential support of the implementation of climate smart management by the existing European legal framework (e.g. ELER) in the different European regions. The policy analysis includes feedback from the survey, regional and European stakeholder workshop. Based on these results, we aim to identify barriers and options to use the current agricultural policy and its instruments to extend the implementation of innovative management techniques. Furthermore, carbon footprints, labels and carbon markets are analysed. Based on the analysis of existing successful systems, suitable policy instruments will be designed that act on the most urgent barriers, costs and legal constraints.

In Sweden, the Board of Agriculture regards the projects’ result to be of interest for the CAP and the CAP 2020+, most importantly for the Swedish rural development program. Already in this program period, there is a support for establishment of wetlands and the project can provide input on the importance of locating wetlands to organic soils. If the project will provide measures that can decrease greenhouse gas emissions from organic soils besides “classical” rewetting, the result can generate a discussion about economic support for such actions in the coming program (post 2020).

In Finland, controlled drainage on peat soils is subsidized in the Rural Development Programme in 2014-2020. The role of the CAOS project is important as it can distribute information on the practical applicability and environmental benefits of the technique to farmers and thus encourage them to apply controlled drainage on their fields. The project can help in formulating the Programme for 2020-2030.

3.2. Do you have established contacts with policy makers? If yes, could you please provide more detailed information? (National, European or international level, which organizations etc.)

The project itself aims to establish contacts with policy makers at the regional, national and European level. Furthermore, the project partners have very active contacts with policy makers as outlined below.

#### **Regional stakeholder workshops:**

- Finland (27.09.2016): Finish Ministry of Agriculture and Forestry, Centre for Economic Development, Transport and the Environment (local environmental office).
- Estonia (29.09.2016): Agro-Environment Bureau, Estonian Fund for Nature.
- Denmark (04.10.2016): Danish Nature Agency, representatives of local authorities, Danish Farmers' Associations (Agri Nord).
- Sweden (07.10.2016): Representative of the Federation of Swedish Farmers, Regional County Administrative Board (Environment and Climate), Swedish Board of Agriculture.
- Netherlands (13.10.2016): Representatives of the Water Board, representatives of the Farmers' Association, provincial authorities (South- and North-Holland, Utrecht and Friesland), some dairy farmers with submerged drains.
- Germany (forthcoming): Bavarian Ministry of Food, Agriculture and Forestry, Bavarian Ministry for the Environment and Consumer Protection, Bavarian Environment Agency; local agricultural and environmental authorities, representatives of the Bavarian Farmer' Association.

We conducted interview with farmers on the use of peatlands and their perception of more climate-friendly management alternatives. During the regional stakeholder workshops, the experimental field sites of the project have been visited. Furthermore, the results of the interviews and projects' goals and preliminary results were discussed with farmers and different stakeholders. The results of the interviews and the workshops will be summarized and used as basis for a **European Stakeholder Workshop** to be held in 2017.

#### **Thünen Institutes for Climate-Smart Agriculture and for Rural Studies (Braunschweig, Germany)**

- Institute for Climate-Smart Agriculture: responsible for the national greenhouse gas inventory of agriculture, land-use, land-use change and forestry, by formal mandate of German Ministry of Food and Agriculture.
- Consultation to German Ministry of Food and Agriculture on climate smart agriculture, e.g. on:
  - the proposed inclusion of LULUCF into the climate and energy package by the EU,
  - the Climate Action Plan 2050 (Parts on Agriculture, Food, Land Use and Forestry),
  - the “4 per 1000” initiative (Carbon Sequestration in Soils for Food Security and the Climate),
  - peatland protection, peatland management strategies and future agricultural use of peatlands.
- Contacts to the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety and various State Ministries of Agriculture or Nature Conservation.

#### **Natural Resources Institute Finland (Luke) (Jokioinen, Finland)**

- Responsible for the national greenhouse gas inventory of agriculture, land-use, land-use change and forestry committed by a contract with Statistics Finland.
- Several meetings in 2016 with the Ministry for Agriculture and Forestry on the assessment of the GHG mitigation potential of agricultural soils.
- Luke experts have been evaluating the potential effects of the proposed inclusion of LULUCF to the climate and energy package by the EU (20.7.2016). There have been discussions with the Ministry of Agriculture and Forestry on this issue, including the potential to reduce the emissions from cultivated peat soils, and input to the discussion documents sent from Finland to the DG

Climate. The representatives of DG Climate will take part in a workshop with researchers in November in Finland.

- Several statements on climate issues have been given to the Parliament Committees including recommendation on actions on cultivated peat soils

#### **Aarhus University, Department of Agroecology (Tjele, Denmark)**

- Policy support for the Danish Ministry of Foods, Agriculture and Fisheries
- Support for the annual inventory report on GHG emissions in Denmark submitted under the United Nations Framework Convention on Climate Change and the Kyoto Protocol.

#### **Swedish University of Agricultural Sciences, Department of Soil and Environment (Uppsala, Sweden)**

- Contacts to The Federation of Swedish Farmers (LRF) on national and regional level
- Contacts to Swedish Board of Agriculture (national level)
- Contacts to Politicians in the Swedish Riksdag (parliament; national level) and local government (municipal level)
- Contacts to the Swedish Environmental Protection Agency (national level)

#### **DLO-Alterra (Wageningen, The Netherlands)**

- Participation in the “ELER-Partnerbeteiligung” event at 19./20. October 2016 (Hannover, Germany) on the topic “Agriculture and Climate Change - Challenges and potential contributions of ELER” including a presentation on “Submerged drains as a method to conserve peat soils in agricultural use” as one of the most promising solutions in The Netherlands to diminish peat soil oxidation and a way to make peat soils more climate resistant. Participants: representatives of ministries from the German Federal State, several Federal Ministries, representatives of the German government in Brussels, the German farmers association and representatives from Nature organizations and other societal organizations.
- Contacts with a member of parliament for the Dutch Socialist Party (SP); meeting about ways to diminish subsidence and CO<sub>2</sub>-emissions of peat soils.
- Contribution to a presentation on among others peat soils and GHG and climate issues to the party-program commission of the Democrats66 (D66), a liberal party in The Netherlands.
- Contributions to several meetings of Green Heart Program commissions. In this commission the “peat-provinces” Utrecht, South-Holland and North-Holland coordinate and develop the strategy to tackle the problems associated with peat soils (among others subsidence, GHG emissions, water management and water quality).
- Numerous contacts with civil servants of provinces, water boards, farmers association LTO-North, etc.
- Presentation and discussion about the use of submerged drains with dairy farmers in the polder Koufurderrige (Friesland) and polder Nieuwland (South-Holland) and Water Board Rivierenland
- Presentation “Subsidence and CO<sub>2</sub> emissions of Dutch peat soils in agricultural use and submerged drains infiltration to diminish peat oxidation” for the Board of the International Peat Society (IPS) at 16 November 2016 in Naaldwijk.
- Presentation of peat soils in a news item of France 2 on subsidence in The Netherlands: [http://www.francetvinfo.fr/replay-rt/france-2/20-heures/rt-de-20h-du-mercredi-14-decembre-2016\\_1958089.html](http://www.francetvinfo.fr/replay-rt/france-2/20-heures/rt-de-20h-du-mercredi-14-decembre-2016_1958089.html) The first few minutes you will see some commercials. After that you can go to about 18 minutes, where the item about subsidence in The Netherlands starts. The item is based on a report of PBL. The report (in Dutch) can be downloaded from: <http://www.pbl.nl/sites/default/files/cms/publicaties/pbl-2016-dalende-bodems-stijgende-kosten-1064.pdf> An English summary with conclusions can be downloaded from: <http://www.pbl.nl/en/news/newsitems/2016/subsidence-of-peatlands-leads-to-high-costs>

#### 4. Key practical findings / innovative solutions

Overarching objective of our project is to implement innovative climate smart management options for organic soils. The feasibility and implications for production are tested by on-farm water and soil management experiments addressing country-specific challenges regarding soil properties and agro-economic circumstances. In addition to existing field data from The Netherlands on experiments with controlled drainage and subirrigation, we conduct field experiments in Denmark, Estonia, Finland and Sweden to produce so-far lacking measurement based data for 1) adapting cultivation and management strategies for future climatic conditions while 2) finding the best practices to mitigate GHG emissions from organic soils. We will synthesize biomass quantity and quality, GHG emissions and costs to find optimal solutions for different climatic and economic situations and agricultural production goals. Specifically, we want to provide field experimental evidence that

- highly productive energy crops of good quality for biogas or combustion can be grown at a high water table both under nutrient-rich conditions on former conventional agricultural areas and under nutrient-poor conditions on abandoned former peat extraction sites,
- water management by e.g. controlled and subirrigation drainage (Fig. 1) can stabilize groundwater levels, improve and stabilize crop yields and reduce GHG emissions and nutrient losses,
- innovative soil management can improve trafficability,
- synergies with water quality improvement can be achieved.

Furthermore, we will improve our understanding of the water and soil management techniques. We will better understand the effects of fertilisation and harvest on the yield of these species in quantitative and qualitative terms, and thus give recommendation on the choice of crops, their management and their environmental effects. We will show that these adaptation options have a major positive impact on the emissions of GHGs, thus slowing down subsidence and the loss of soil organic carbon, while improving the water quality.

We will develop and apply an improved coupled hydrological and crop growth model. With this model, we will evaluate the proposed management options compared to deep unregulated drainage under current and changing climatic conditions. Optimal management strategies increasing the synergies between adaptation, mitigation and agro-economic indicators will be identified.



*Fig. 1: Installation of subsurface drains for subirrigation in grassland on peat soil (Photo: B. Tiemeyer)*

#### 5. Please provide contact information (telephone number, email) for a more detailed follow-up.

Thünen Institute of Climate-Smart Agriculture, Braunschweig, Germany (Coordinator): Dr. Bärbel Tiemeyer (baerbel.tiemeyer@thuenen.de, +49 (0)531-596 2644)

Thünen Institutes for Rural Studies (Braunschweig, Germany): Dr. Norbert Röder (norbert.roeder@thuenen.de)

Natural Resources Institute Finland (Luke) (Jokioinen, Finland): Prof. Kristiina Regina (kristiina.regina@luke.fi)

Aarhus University, Department of Agroecology (Tjele, Denmark): Dr. Poul Erik Lærke (poule.laerke@agro.au.dk)

Swedish University of Agricultural Sciences, Department of Soil and Environment (Uppsala, Sweden): Dr. Kerstin Berglund (kerstin.berglund@slu.se)

DLO-Alterra (Wageningen, The Netherlands): Jan van den Akker (janjh.vandenakker@wur.nl)

University of Tartu, Institute of Ecology and Earth Sciences (Tartu, Estonia): Prof. Ülo Mander (ulo.mander@ut.ee)

## 6. Please provide a list of publications in Annex

### Peer-reviewed publications:

Kandel T.P, Elsgaard L., Andersen M.N. and Lærke P.E. (2016): Influence of harvest time and frequency on light interception and biomass yield of festulolium and tall fescue cultivated on a peatland. *European Journal of Agronomy* 81:150-160.

### Conferences contributions:

Berglund, Ö., and Berglund, K. (2016): CO<sub>2</sub> emissions from cultivated peat soil with sand addition, a CAOS project. Poster at: 15<sup>th</sup> International Peat Congress 'Peatlands in Harmony – Agriculture, Industry and Nature', Kuching, Sarawak, Malaysia (15.-19.08.2016). Abstract No: A-038, p 292-295.

Lærke, P.E., Kandel, T., Karki, S. and Elsgaard, L. (2016): Greenhouse gas balance of biomass grown for biogas production on rewetted agricultural fen peatland. Oral presentation at: 15<sup>th</sup> International Peat Congress 'Peatlands in Harmony – Agriculture, Industry and Nature', Kuching, Sarawak, Malaysia (15.-19.08.2016), p. 184.

Myllys, M., and Regina, K. (2016): Climate smart agriculture on organic soils CAOS. Poster at: Peatlands in the Bioeconomy World, Helsinki (02.02.2016)

Piayda, A., Tiemeyer, B., Bechtold, M., and Dettmann, U. (2016): Past management influences on the properties of organic soils. Poster at: 5<sup>th</sup> International EcoSummit 'Ecological Sustainability - Engineering Change', Montpellier, France (29.08.-01.09.2016).

Piayda, A., Tiemeyer, B., Berglund, K., Lærke, P.E., Mander, Ü., Regina, K., Röder, N. and van den Akker, J. (2015): Klimaschutz und -anpassung der Landwirtschaft auf organischen Böden: Ein FACCE-ERA-Net Plus Projekt. Oral Presentation at: DGMT Conference 2015, Berlin (23.09.-18.09.2015)

Piayda, A., Tiemeyer, B., Berglund, K., Lærke, P.E., Mander, Ü., Regina, K., Röder, N. and van den Akker, J. (2015): The FACCE-ERA-Net Plus project 'Climate smart Agriculture on Organic Soils'. Poster at: MACSUR Science Conference 2015, Reading (08.04.-10.04.2015).

Tiemeyer, B. et mult. al. (2015): GHG fluxes from organic soils: from drivers to management approaches. Oral presentation at: FACCE MACSUR Joint Workshop 2015, Braunschweig (27.10.-30.10.2015)

Tiemeyer, B., Bechtold, M., Berglund, K., Berglund, Ö., Breitsameter, L., Freibauer, A., Hendriks, R., Hoving, I., Järveoja, J., Kandel, T., Lærke, P.E., Maddison, M., Mander, Ü., Myllis, M., Piayda, A., Osterburg, B., Regina, K., Röder, N., and van den Akker, J. (2015): The FACCE-ERA-Net Plus project 'Climate smart Agriculture on Organic Soils' (CAOS). Poster at: Climate-Smart Agriculture 2015, Montpellier (16.03.-18.03.2015).

### Other publications:

Akker, J.J.H, and Hendriks, R.F.A. (2014): Hogere grondwaterstanden voor veenweiden : aangepast watermanagement noodzakelijk voor beperking veenafbraak. *Bodem : Kwartaalblad voor informatie-uitwisseling en discussie over bodembescherming en bodemsanering* 24: 7-9.