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Economic incentives for climate smart agriculture on peatlands in the EU

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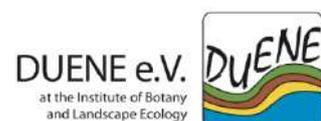
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Examples for climate smart agriculture on peatlands:

- Summer harvest of reed (*Phragmites australis*) for biogas generation (top left)
- Sphagnum farming site with peat mosses (*Sphagnum palustre*, *S. papillosum*) for horticultural growing media and Sundew (*Drosera rotundifolia*) for medicinal products (top right)
- Cattail cultivation (*Typha latifolia*) for cattle feed, for insulation / construction material and for pollen used for mites in biological pest control (bottom left)
- Winter harvest of reed (*Phragmites australis*) as traditional thatching material (bottom right)





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[Any additional information or corrections are welcome!](#)

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Abbreviations

AES	Agri-environment scheme
AECS	Agri-environment-climate scheme
AFOLU	Agriculture, forestry and other land use
CAP	Common Agricultural Policy
EAFRD	European Agriculture Fund for Rural Development
ELS	Entry Level Scheme
ERDF	European Regional Development Fund
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
GHG	Greenhouse gases
HLS	Higher Level Scheme
IUCN	International Union for Conservation of Nature
NGO	Non-governmental organisation
PES	Payments for Ecosystem Services
RDP	Rural Development Programme
SCaMP	Sustainable Catchment Management Programme
SWW	South West Water
UK	United Kingdom
UN	United Nations
UU	United Utilities
WFD	Water Framework Directive

Summary

Europe is a global hot spot for CO₂ emissions from drained peatlands, being the second largest emitter after Indonesia. Decarbonisation targets will be failed without a strong effort to mitigate emissions from carbon rich soils by raising water levels. Climate smart agriculture on peatlands is paludiculture: land use options for wet and rewetted peatlands that balance the production of market goods with peat maintenance and the provision of other ecosystem services. The change to paludiculture, however, is a paradigm shift compared to centuries of drainage based peatland utilisation. On the long run, the prohibition of peatland drainage is inevitable. To allow for a gentle transition, there is a high need to set the course today to make future peatland utilisation ecologically, economically and socially sustainable.

As for historic peatland reclamation, concerted action and the provision of economic incentives has to be initiated in a top-down approach to achieve large-scale implementation of climate smart agriculture on peatlands. For the regional design, however, a bottom-up approach is necessary to ensure the development of adapted solutions and their acceptance. The regulatory framework of the EU Common Agricultural Policy (CAP) seems well suited to prescribe direction and provide money to achieve the goals. Additional funding may be provided by the European Regional Development Fund. Privately financed payments (e.g. voluntary carbon markets, water companies financing peatland restoration in their catchment areas) have been of limited outreach, but may complement government funded schemes and inspire initiatives elsewhere.

The review identified a wealth of good practise examples implemented in single European Member States that a) provide incentives to invest in rewetting, to maintain target water levels, and to adapt management, b) ensure efficiency (e.g. target areas, indicator species, scoring systems) and c) facilitate implementation (advisory services, land consolidation, cooperation at landscape scale). While the current focus is on peatland restoration, wetland (re-)establishment or grassland management for the benefit of biodiversity, water quality or carbon store, many established measures are already suitable or can be refined to support the shift to climate smart peatland agriculture. Additionally to CAP funding, single pilots on the economic use of rewetted peatlands are co-financed by the European Regional Development Fund and a unique regional scheme supporting the adaption of peatland agriculture to raised water levels by e.g. planting adapted crops and buying adapted machinery is under appraisal.

Current shortcomings are the conflicting support for drainage based peatland use in CAP 1st and 2nd Pillar, uncertainty about the acknowledgment of wetland adapted plant as agricultural crops, the lack of real incentives remunerating public benefits in addition to any biomass revenues and the lack of long-term schemes (e.g. 15-20 years) to convince farmers and ensure planning security. Farmers need to experience public appreciation for ecosystem services provided by wet peatlands and require economic incentives sufficiently attractive to initiate the shift to paludiculture and making the provision of public benefits economically viable at farm level.

Finally, identified good practise examples are implemented only partly and in single Member States. Enhancing the exchange among peatland rich Member States seems crucial, – this report hopes to facilitate mutual interaction. Current experiences and approaches can inspire the development of comprehensive, attractive programmes for agricultural used peatlands turning regions being burdened with a disproportional high share of European greenhouse gas emissions into pioneers for climate change mitigation and adaptation.



Field prepared for potato cultivation on peat soil, causing large amounts of GHG emissions. Funding the conversion of arable land into grassland, however, has little climate mitigation effect, since schemes usually lack requirements to raise the water level.

Key findings & Recommendations

Peatlands are marginal lands; their utilisation has been highly influenced by subsidies – from their reclamation up to present land use practices. With this review, we described economic incentives in selected European Member States that already reward the provision of peatland or wetland ecosystem services. We identified good practice examples and current shortcomings and derived recommendations for refining and developing economic incentive, which can initiate and support climate-smart agriculture on peatlands.

Current situation

- *The Common Agriculture Policy (CAP) has a decisive steering effect on peatland use and would be well suited to set a new course.*
CAP subsidies strongly influence peatland use throughout the EU, both by 1st Pillar payments and by various 2nd Pillar payments, which support continued current drainage based agriculture (e.g. direct payments, compensation for disadvantaged areas) and co-finances agri-environment measures.
- *Other incentives are limited in outreach, but may encourage emulation in other regions and countries.*
Next to EAFRD funding (2nd Pillar), some regions use co-funding of ERDF for implementing projects on peatland rewetting (e.g. covering costs of expertise, consultation, round table) and funding pilot projects and research on climate-smart agriculture on peatlands (e.g. Lower Saxony and Bavaria / Germany). Some management schemes are financed with national government money only (e.g. for ‘nature areas’, including traditional reed harvest in the Netherlands). Voluntary private payments for ecosystem services are only of local or regional importance but can have a large outreach in terms of awareness raising for the importance of peatlands for climate protection (e.g. MoorFutures in Germany, UK Peatland Code) or flood control and water quality (e.g. Pumlumon Project in Wales, UK water companies) and can inspire similar initiatives elsewhere.
- *Existing instruments usually address only single peatland / wetland services or biodiversity.*
There are few examples addressing the protection of the carbon store and incentivising raising of water levels (e.g. UK; Brandenburg/Germany). Denmark and Sweden focus on wetland (re-)establishment for nutrient retention, but partly consider reduced GHG and especially biodiversity enhancement as co-benefits. Predominant and wide-spread are schemes on the maintenance and restoration of near-natural peatland habitats or grassland habitats in general, e.g. for breeding waders.
- *Biomass utilisation is either not intended or reduces the Pillar 2 payments. No incentives were identified that explicitly support the shift from drainage-based peatland agriculture to paludiculture, i.e. a balanced provision of provisioning and regulating services.*
Payment heights are calculated based on the costs of measures, lost income or reduced land value and a small share can compensate for transaction costs. No incentives are provided for implementing an economic utilisation of biomass from wet peatlands. If realised, revenues reduce the payment height. Incentives for processing and marketing of wetland biomass are missing in current schemes (Table 1).
- *Pillar 2 funding is used to co-finance a wide range of restoration and maintenance measures linked to achieving agri-environment-climate objective on peatlands,*
including the investment in rewetting measures (e.g. ditch blocking in England, re-establishment of wetlands on intensively farmed lowland areas with carbon rich soils in Denmark), raising water levels and keeping them high (e.g. fixed weir in Brandenburg/Germany, maintaining rewetting in Wales), establishing wetland plants (e.g. reed beds in UK) and mowing or grazing schemes with certain requirements in all countries (e.g. for meadow birds in the Netherlands), in single cases providing bonus payments for additional difficulties as wet conditions and special machinery needed (e.g. Bavaria, Italy).

Clear guidance on target water level is, however, often missing (e.g. controlled drainage in Finland and Sweden; transformation of arable land into grassland in Germany, habitat management in Poland) thus lacking a considerable climate mitigation effect.

- *Funding is input-based, rather than output-based; but targeting approaches increase efficiency.*
As prescribed by the EU regulations, 2nd Pillar payments are calculated based on input / opportunity costs (see above), not based on output / achieved results. To target measures and improve their cost-effectiveness some countries / regions use indicator species or groups of species (e.g. habitat management in Poland), engage facilitators or contract managers (e.g. fixed weir in Brandenburg/Germany), mark out target areas (e.g. maps of carbon priority 1-3 in Wales, online targeting tool in Scotland), prescribe a minimum efficiency for proposed measures (e.g. reduction of N and CO₂ emissions in Denmark), or implement scoring systems (e.g. UK; wetland establishment in Sweden).
- *From individual measures on single plots to cooperative management at landscape scale.*
Next to the predominant funding of individual measures on single plots, there are some schemes that engage (nearly) all land of a single farm (e.g. Grassland management on peatland in Schleswig-Holstein/Germany; Farm Environment Assessment in Scotland) as well as approaches to either accept only proposals of farming collectives (e.g. Netherlands) or to incentivise joint application and cooperative projects at landscape scale (e.g. facilitation fund in England; environmental cooperation in Sweden). Cooperation shall increase outcomes and is specifically important if measures can be implemented only in a landscape or catchment area approach.
- *Short-term funding is predominant, long-term funding is implemented as an exception.*
One-off payments are available for investment measures (e.g. ditch blocking and field drain breaking in Scotland; feasibility studies, land allocation, construction costs for wetland projects in Denmark). Funding for management measures usually lasts 5 years (4-7 years). For certain measures, prolonged funding of 10 years is possible (e.g. England). Long-term funding of 20 years has been an exception (see Table 1), but can be justified if only long commitment periods guarantee optimal effects (e.g. maintenance of high water levels in wetland projects in Denmark).
- *Payment height influences uptake of measures*
The current opportunity costs and the perceived value of land influence the uptake of measures (e.g. upland peatlands vs. lowland peatlands in England, transforming arable land into (permanent) grassland in Bavaria/Germany). Annex 2 of regulation (EU) No 1305/2013 on support for rural development defines upper limits for agri-environment-climate measures with annual per hectare payments of € 600 for annual crops, € 900 for specialised perennial crops and € 450 for other land uses, however, “these amounts may be increased in duly substantiated cases” (e.g. grassland management in the Netherlands).
- *Advisory services and assistance*
Rural development programmes can include funding for advisory services to improve economic and environmental performance or provide information on climate change mitigation and adaptation, biodiversity and the protection of water (Article 15, cf. Table 3). Special advice on peatland utilisation is offered for farmers in Lower Saxony and Mecklenburg-Western Pomerania (Germany) to inform on the impacts of drainage-based peatland use and overcome the lack of knowledge on alternatives (cf. stakeholder aspects), but it is yet no standard instrument (see Table 1).
- *Acceptance and efficiency*
Availability and design of certain subsidies say little about their acceptance and efficiency. Limited financial resources may for instance result in unattractive payment rates or in schemes which can be entered only in single years or for a small area. An extensive evaluation of specific schemes would be necessary to extend the limited and selective information given here.

Recommendations for setting a new course

A large-scale shift to paludiculture calls for instruments that ...

...overcome current shortcomings:

- **Phase out CAP 1st and 2nd Pillar support for drainage based peatland use** to achieve coherence of agricultural and climate policy and to demonstrate that a paradigm shift is indispensable.
- Ensure general **eligibility of wetland adapted crops for agricultural payments** in 1st and 2nd Pillar, not only as exception if benefiting the targets of Habitats, Birds and Water Framework Directives.
- Provide **attractive incentives** by remunerating reduced GHG emissions and the provision of other services (e.g. nutrient retention) in addition to any biomass revenues.
- Run **long-term schemes** (e.g. 15-20 years) to convince farmers, provide planning security and ensure continuity of climate and environmental benefits.

...make use of and refine the “tool box” already offered, mainly within CAP 2nd Pillar (cf. Table 3, country examples), to provide incentives for all steps of implementation:

- **Establishment:** compensate for high investment costs to facilitate the land use change.
- **Raising water level:** support investment in infrastructure for water management; reward the maintenance of high water levels; facilitate land consolidation to cut costs by large-scale rewetting.
- **Management and harvest:** Support purchase of adapted mowing and harvesting technique; compensate for adapting management to enhance biodiversity.
- **Processing and marketing:** support renewable and innovative products, support bridging the gap between biomass production and demand (e.g. fixed higher prices, prescribed share in public procurement); communicate and reward provided public benefits (carbon store, water quality, water storage, biodiversity).
- **Knowledge transfer and advice:** increase and spread knowledge on impacts of drainage based land use, alternative options and processing avenues of new crops; support pilot sites and demonstration farms.
- **Cooperation:** support cooperation among farmers and with other stakeholders (e.g. facilitators to initiate and accompany processes at landscape level) or encourage joint action (sharing machinery for harvest and processing, joint marketing).

...learn from extended experiences in other peatland rich regions and consider region-specific circumstances (e.g. site conditions, socio-economy, attitude of farmers and local people) to develop tailored solutions that are

- **accepted by stakeholders:** e.g. early involvement; rewarding instead of compensating; ensuring income and reducing financial risks; basic entry measures and flexible combination with different targeted high-level measures.
- **result-orientated:** make use of targeting approaches (e.g. carbon priority maps) and develop evidence based, outcome orientated schemes (e.g. indicator species or species groups and wetland crops; lack of negative indicators).
- **good value-for-money:** e.g. scoring systems; compare with other measures to reduce agricultural GHG emissions.



The traditional harvest of reed as thatching material is an established example for the sustainable use of wet peatlands, which benefits biodiversity, water quality, and climate mitigation, maintains cultural values and generates local income. Some EU Member States already support the establishment and harvest of reedbeds.

1 Introduction

The Paris agreement has set a clear target of minimising global warming to well below 2°C compared to the pre-industrial level (UN 2015). Every economic sector is obliged to make a strong effort to achieve the common target of net zero global emission in the second half of the 21st century. The land use sector (AFOLU- Agriculture, forestry and other land use) is responsible for 24 % (in 2010) of the global anthropogenic greenhouse gas (GHG) emissions (Smith et al. 2014). The options to reduce agricultural non-CO₂-emissions (CH₄, N₂O) are limited; plausible development pathways would deliver only 21-40 % of the needed mitigation (Wollenberg et al. 2016). Reducing CO₂ emissions from carbon rich soils is crucial for achieving agriculture-related mitigation targets and peatland rewetting is the most cost efficient land use based GHG abatement measure, e.g. in Germany (Röder et al. 2015). Peatland drainage accounts for 32 % of global cropland emissions despite peatlands producing just 1.1 % of total crop kilocalories (Carlson et al. 2017). Whereas Indonesia is known as most important hot spot for CO₂ emissions from drained peatlands, other regions are often overlooked: Europe is the second largest emitter.

Climate smart agriculture on peatlands implies raising and keeping the water level near to the surface (Biancalani & Avagyan 2014). Next to mitigating GHG emissions, high water levels halt subsidence and stop land degradation, thus being inevitable to prevent the loss of productive land. However, lowering the water table has been the basis of peatland reclamation throughout human history. Usually it was in the face of adversity as wars or a high population growth that peatland reclamation was instructed in a top-down approach. In Europe, it took centuries and the initiatives of several rulers until privileges for colonists, the provision of subsidies, the deployment of prisoners and finally the utilisation of large machines succeeded in the large-scale drainage of peatlands. Current knowledge, crops, machinery and subsidy schemes still relate to drainage based cropping systems, - despite the changed societal challenges to rewet peatlands for climate mitigation.

Until now, current EU policies hamper the cultivation of crops as Reed, Cattail and Peat mosses (*Sphagnum*) (see cover), which are suitable for the productive use of wet or rewetted peatlands known as paludiculture (*palus* – Latin: swamp; cf. Wichtmann et al. 2016). Many species are considered not eligible for direct payment under the 1st Pillar of the Common Agricultural policy (CAP) (Kölsch et al. 2016), and obligations to maintain permanent grassland impede the rewetting of grassland for permanent paludicultures (Czybulka & Kölsch 2016). In contrast, economic competitiveness of drainage based peatland utilisation is highly supported by current economic incentives (Pillar 1, Pillar 2, renewable energy) as well as by spreading drainage related costs on society.

There is a high need to set the course today to make future peatland utilisation sustainable. As in former times, the society is responsible to initiate land use changes on peatlands, not the single farmer. For achieving a shift from drainage-based to climate-smart agriculture, the development of incentives that account for social and environmental cost and benefits has been identified as a major action (FAO 2016). This report compiles incentives and instruments that already acknowledge peatland ecosystem services. This overview on existing schemes in selected EU member states is provided to enhance an exchange on pros and cons of current approaches and the refinement necessary to support large-scale implementation of paludiculture.

2 Methods

Wet peatlands are multifunctional landscapes. Next to the importance of peatlands as major terrestrial carbon store, the regulation of water quantity and quality, the habitat of specialised species or cultural values may be of primary interest. Regional economic incentives thus may focus on other ecosystem services but provide climate mitigation as a co-benefit. Furthermore, current payment schemes often do not distinguish between peat (or more general organic) soils and mineral soils. Therefore, the study included incentives for managing, rewetting or constructing wetlands in general.

The study focused on incentives widely available for agriculturally used land, mainly agri-environment-climate schemes and other actions supported within the 2nd Pillar of the CAP, which are co-funded by the European Agricultural Fund for Rural Development (EAFRD). Rural development programmes (RDPs) determine the national implementation of the aims of the 2nd Pillar of the CAP. To account for differences among countries or regions, the 28 EU Member States elaborated 118 different RDPs for the current funding period (2014-2020)¹. Next to the large number, language barriers limit accessibility, since RDPs are available only in the corresponding national language. After research on the RDPs of the CINDERELLA project countries Denmark, Germany, The Netherlands and Sweden (Fig. 1), examples of peatland related incentives from other European countries were included for supplementation.



Fig. 1. CINDERELLA project countries

Next to RDPs, I reviewed literature and reports dealing with publicly funded agri-environment schemes (AES) as well as with private schemes providing Payments for Ecosystem Services (PES). I excluded financial instruments as EU LIFE that enable pilot projects on peatland restoration all over Europe but support specific projects for innovation rather than replication (Peters & Unger 2017) and voluntary payments as donations.

A survey was elaborated to elicit additional information (see Annex). Accompanying a poster titled “Review on economic incentives for wet peatlands”, the survey was spread on two international conferences, one in Germany (RRR 2017 - Renewable resources from wet and rewetted peatlands², September 2017) and the other in Sweden (International Conference on Climate Smart Agriculture on Organic Soils³, November 2017). Additionally, the survey was set up as online form (<http://survey.paludiculture.com>) with the information spread via the mailing group “Peatlands and climate change mitigation group for Organic Soils and Peatland Mitigation Initiative” hosted by the FAO, the Bulletin of the International Mire Conservation Group and the Newsletter of the CINDERELLA project.

Experts from different European countries were contacted directly upon recommendation of CINDERELLA colleagues, during the above-mentioned conferences as well as at workshops on “Paludiculture UK – Working with wetlands” in Kendal/England (November 2017) and on “Setting the course for EU policies on peatland climate mitigation” held in Berlin/Germany (June 2017) and in Brussels/Belgium (December 2017).

Note: For comparability, all monetary values given in this report are translated into EUR as standard currency using conversion rates from January 2018; - thus real-life payments in national currencies may differ slightly.

¹ https://ec.europa.eu/agriculture/rural-development-2014-2020/country-files_en

² www.rrr2017.com

³ www.slu.se/CAOSconference

3 Results & Discussion

3.1 Availability of information

While there is a large number of peer-reviewed articles on agri-environment schemes (Web of science, 21.12.2017: n=1,203), only one of them relates also to peatlands. Searching for articles on payments for ecosystem services delivers similar results (n=1,330) with very few papers related to peatlands (n=7). Only three of these articles use specific instruments as case studies, namely the Glastir agri-environment scheme in Wales/UK (Reed et al. 2014) and voluntary carbon markets in Germany (MoorFutures®) and the UK (Peatland Code) (Bonn et al. 2014, Reed et al. 2017).

Some information can be derived from reports, e.g. on the public funding of peatland management and restoration in the UK (Keenleyside & Moxey 2011) or from compilations of best practice PES examples (e.g. DEFRA 2013; Matzdorf et al. 2014; Nordic Council of Ministers 2009), which also encompass some peatland or wetland related cases. However, the examples are repeating and most are from English speaking countries. It can be assumed that information of the majority of European countries is veiled for the international community since it is provided only in national languages as in the case of RDPs. Furthermore, information becomes quickly outdated since RDPs are elaborated for short EU funding periods of seven years (e.g. 2007-2013 and 2014-2020) and changes occur even within the periods.

The conducted survey aimed at disclosing additional examples of economic incentives for wet peatlands or wetlands in Europe as well as information on whom to contact for detailed experiences. Unfortunately, the return was disappointingly limited (n=9). However, answers from e.g. Canada and Southeast Asia (Indonesia and Laos) indicated that economic incentives for improving the provision of peatland ecosystem services are a hot topic all over the world and there is a need for further exchange. Not only the availability of information is limited, but indeed also few good practise examples are in place.



Peatland meadows intensively managed and drained to produce high-quality staple feed for dairy cows and ensure sufficient bearing capacity for heavy machinery.

Table 1: Overview on economic incentives addressing peatland or wetland ecosystem services.

	State - region	Ecosystem service					Financing			Payment			Point along production chain				Scheme		Implement-ation					
		Carbon store	Water quality	Water quantity	Biodiversity	Recreation	Others	EU	National	Compulsory	Voluntary	One-off	Short term	Long term	Establishing	Rewetting	Management	Processing	Marketing	Input-based	Output-based	Cooperation	Advice	
Rural development programmes – EAFRD (public)																								
(Re-) Establishment and maintenance of wetlands	DK	(x)	x		(x)			x	x				x		x					x	(x)			
Habitat management; conversion to grassland	D-BAV	(x)	x		x			x	x						(x)					x				
Water retention on peatland, conversion to grassland	D-BB	x	x					x	x						x					x	(x)			
Habitat management; rewetting	D-LS	x			x			x	x						x					x	(x)			
Habitat management; rewetting; conversion to grassland	D-MW	x	x		x			x	x						x					x	(x)			
Habitat management; rewetting	D-SH	x	x		x			x	x						x					x	(x)			
Habitat management; organic soil protection	EST	(x)			x			x	x						x					x				
Habitat management; water category	NL	x	x		x			x	x						x					x				
Construction and restoration of wetlands; cooperation	S	(x)	x	(x)	x	(x)		x	x						x					x	(x)			
Adjustable / controlled drainage (control wells)	S + Fi	(x)	x	(x)				x	x						(x)					x				
Habitat management	It				x			x	x						x					x				
Fen habitats and endangered species	PL				x			x	x						x					x	(x)			
Countryside stewardship scheme: uplands and lowlands	UK-E	x	x	x	x	x		x	x						x					x	(x)			
Agri-environment-climate scheme: uplands and lowlands	UK-S	x	x	x	x	x		x	x						x					x	(x)			
Sustainable management scheme 'Glastir'	UK-W	x	x	x	x	x		x	x						x					x	(x)			
Regional development – ERDF (public)																								
Reducing CO ₂ emissions from peatlands (pilots)	D-BAV	x						x	x						x					x				
Reducing CO ₂ emissions from peatlands (pilots)	D-LS	x						x	x						x					x				
Payments for ecosystem services (private-voluntary)																								
MoorFutures®	D	x	(x)	(x)	(x)	(x)									x					x				
Peatland Code	UK	x													x					x				
Upstream thinking	UK-E	(x)	x	(x)	(x)										x					x	(x)			
Payments for ecosystem services (private-compulsory)																								
Peatland rewetting, financed by water fee	D-SH		x	x	x										x					x	(x)			
Payments for ecosystem services (mixed: public & private)																								
Sustainable Catchment Management Programme	UK-E	(x)	x	(x)	x	(x)		(x)							x					x	(x)			
Pumilion project	UK-W	x	x	x	x	x		x	x						x					x	(x)			
Under appraisal																								
Reducing CO ₂ emissions from peatlands (ERDF)	D-BB	x						x	x						x					x	(x)			
Rewetting agricultural land on organic soils	S	x													x									

DK – Denmark, D – Germany (BAV – Bavaria, BB – Brandenburg, LS – Lower Saxony, MW – Mecklenburg-Western Pomerania, SH – Schleswig-Holstein), EST – Estonia, Fi – Finland, It – Italy, NL – the Netherlands, S – Sweden, UK – United Kingdom (E – England, S – Scotland, W – Wales)

3.2 Classification of economic incentives

Details on identified incentives and specific schemes in EU member states are provided in section 3.4 and section 3.5. The overview in Table 1 classifies the economic incentives according to:

- Ecosystem Services in focus (considered co-benefits are put in brackets)
- Sources of the financing (examples in Table 2)
- Duration of the payment (short term: usually 5-7 years, long term: 10-20 years)
- Points addressed along the production chain (examples in Fig. 2)
- Payments for actions/input (e.g. covering costs of management measures) or payment for results/output (e.g. reduced GHG emissions), in brackets if orientation on results by targeting elements (e.g. a prescribed water level or applying scoring systems and target areas)
- Payments supporting general implementation.

Table 2: Sources of financing and types of economic instruments.

Sources of financing	Instruments	Example
Governmental funds (EU and /or national)	- European Agriculture Fund for Rural Development	- Co-financing the 2 nd Pillar of EU CAP, e.g. peatland restoration, habitat management
	- European Regional Development Fund	- Climate mitigation by peatland rewetting (round tables, pilot projects, research)
	- National payment schemes	- Restoration, habitat management
Compulsory measures or payments (costs-by-cause)	- Biodiversity offsetting	- Compensation allowances for building or mining activities used for peatland rewetting
	- Taxes, levies, charges	- Water withdrawal fee used for peatland rewetting to improve water quality
Voluntary payments (allowing for private sector/ persons investment)	- Voluntary markets for ESS	- MoorFutures, UK Peatland Code
	- Sponsorship, donation	- NGOs collecting money for restoration
	- Fees for recreation	- Entrance fee, hunting licence



Fig. 2: Incentives for the management of wet peatlands can focus on any point of the production chain from site preparation to marketing of products and ecosystem services.

3.3 General support measures via EU Rural Development Policy

The Regulation (EU) No 1305/2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) outlines the objectives of the 2nd Pillar of the CAP. Member States may include thematic sub-programmes in their rural development programmes, with “Climate change mitigation and adaptation and biodiversity” being suggested as one of seven priorities. Furthermore, several general support measures (Table 3) are described that could be applied to promote paludiculture, e.g. by raising awareness and improving knowledge on peatland utilisation and sustainable options (Article 14, 15), rewetting and managing peatlands for agri-environment-climate benefits (Article 17, 28), supporting investment along the production chain (cf. Fig. 2), setting up producer groups (Article 27, 35) and payments to compensate for difficulties arising from high water levels (Article 30-32).

The EU Regulation offers a wide range of possibilities. However, it is the task of the single states or regions to make this “tool box” available for the restoration of peatlands and the transition to sustainable management on peat soils by implementing instruments in national/regional Rural Development Programmes, providing co-funding and setting up specific funding guidelines. The detailed descriptions in section 3.4 and 3.5 demonstrate, that some governments (e.g. in the UK) make extensive use of available tools combining especially non-productive investment (Article 17) and agri-environment-climate-measures (Article 28) to enhance biodiversity and ecosystem service provision of peatlands. Other governments, however, offer just some support for an adapted grassland management without addressing differences between mineral and peat soils. All states/regions can further exploit the scope provided by the EU Rural Development Policy to promote an adapted utilisation of peatlands for climate mitigation and climate adaptation, next to enhancing biodiversity, water protection, recreation and the diversification of income opportunities in rural areas.

Table 3: EU rural development measures suitable to promote and implement climate smart peatland agriculture (extracts of regulation (EU) No 1305/2013).

Article 14 – Knowledge transfer & information actions

“Eligible costs under this measure shall be the costs of organising and delivering the knowledge transfer or information action. In the case of demonstration projects, support may also cover relevant investment costs. Costs for travel, accommodation and per diem expenses of participants as well as the cost of the replacement of farmers shall also be eligible for support.”

Article 15 – Advisory services, farm management and farm relief services

“1. [...] help farmers [...] benefit from the use of advisory services for the improvement of the economic and environmental performance as well as the climate friendliness and resilience of their holding, enterprise and/or investment [...] 4.[...] Advice may also cover other issues and in particular the information related to climate change mitigation and adaptation, biodiversity and the protection of water”

Example: funding for advice on climate-smart agriculture on peatlands in two German states

Article 17 – Investment in physical assets

e.g. “non -productive investments linked to the achievement of agri- environment -climate objectives”

Example: paying for the capital cost of ditch blocking to restore peatlands in Wales

Article 18 – Restoring agricultural production potential damaged by natural disasters and catastrophic events and introduction of appropriate prevention action

e.g. “investments in preventive actions aimed at reducing the consequences of probable natural disasters, adverse climatic events and catastrophic events”

Article 20 – Basic services and village renewal in rural areas

e.g. “investments in the creation, improvement or expansion of all types of small scale infrastructure, including investments in renewable energy and energy saving”

Article 21 – Investments in forest area development and improvement of the viability of forests

e.g. “investments improving the resilience and environmental value as well as the mitigation potential of forest ecosystems [...] investments in forestry technologies and in the processing, the mobilising and the marketing of forest products”

Example: restoring afforested sites on deep peat to non-woodland habitats in Scotland

Article 22 – Afforestation and creation of woodland

“cover the costs of establishment and an annual premium per hectare to cover the costs of agricultural income foregone and maintenance, including early and late cleanings, for a maximum period of twelve years. [...] Species planted shall be adapted to the environmental and climatic conditions of the area and shall comply with minimum environmental requirements.”

Article 27 – Setting-up of producer groups and organisations

e.g. “the development of business and marketing skills and the organisation and facilitation of the innovation processes”

Article 28 – Agri-environment-climate measures

“Commitments under this measure shall be undertaken for a period of five to seven years [...] Payments shall be granted annually and shall compensate beneficiaries for all or part of the additional costs and income foregone resulting from the commitments made. Where necessary, they may also cover transaction costs up to a value of 20 % of the premium paid [groups of farmers: 30 %]”

Example: multiple options for the management and creation of peatland and wetland habitats, especially in UK

Article 29 – Organic farming

(see article 28)

Article 30 – Natura 2000 and Water Framework Directive payments

“compensate beneficiaries for additional costs and income foregone resulting from disadvantages in the areas concerned, related to the implementation of Directives 92/43/EEC and Directive 2009/147/EC and the Water Framework Directive. [...] The following areas shall be eligible for payments: (a) Natura 2000 agricultural and forest areas [...] (b) other delimited nature protection areas with environmental restrictions applicable to farming or forests which contribute to the implementation of Article 10 of Directive 92/43/EEC [...]; (c) agricultural areas included in river basin management plans according to the Water Framework Directive.”

Article 31-32 – Payments to areas facing natural or other specific constraints

“compensate farmers for all or part of the additional costs and income foregone related to the constraints for agricultural production in the area concerned [...] eligible for payments [...] if at least 60 % of the agricultural area meets at least one of the criteria listed in Annex III at the threshold value indicated. → Annex III - Biophysical criteria, e.g. “Limited Soil Drainage: areas which are water logged for significant duration of the year (threshold: wet within 80 cm from surface for over 6 months, or wet within 40 cm for over 11 months; poorly or very poorly drained soil)”

Article 34 – Forest-environmental and climate services and forest conservation

“operations consisting of one or more forest-environment and climate commitments [...] Commitments shall be undertaken for a period of between five and seven years. [...] compensate beneficiaries for all or part of the additional costs and income foregone resulting from the commitments made. Where it is necessary they may also cover transaction costs to a value of up to 20 % of the premium paid “

Article 35 – Cooperation

Cooperation relating to e.g. “(a) pilot projects; (b) the development of new products, practices, processes and technologies in the agriculture, food and forestry sectors; (c) cooperation among small operators in organising joint work processes and sharing facilities and resources [...]; (d) horizontal and vertical cooperation among supply chain actors for the establishment and the development of short supply chains and local markets; (e) promotion activities in a local context relating to the development of short supply chains and local markets (f) joint action undertaken with a view to mitigating or adapting to climate change [...] (g) joint approaches to environmental projects and ongoing environmental practices, including efficient water management, the use of renewable energy and the preservation of agricultural landscapes (h) horizontal and vertical cooperation among supply chain actors in the sustainable provision of biomass for use in food and energy production and industrial processes;

Article 51 – Funding technical assistance

“At the initiative of the Member States up to 4 % of the total amount of each rural development programme “

Example: an consultant is engaged to assist farmers in applying for the fixed-weir measure in Brandenburg/Germany



Most wide spread are agri-environment schemes for adapted grassland use to support target species groups as meadow birds or plant communities.

3.4 Examples from CINDERELLA project countries

3.4.1 Denmark

(Re-) Establishment and maintenance of wetlands [public]

The reduction of nutrient losses from agriculture has been a major agri-environmental target in Denmark since the mid-1980s; in 1998, subsidies for the establishment of wetlands were introduced as additional policy measures (Mikkelsen et al. 2005). The current EU co-funded RDP⁴ provides action-based funding for the construction or re-establishment of wetlands: a) large N and P wetlands, involving several landowners and established mainly by municipalities, b) mini-wetlands for treating agricultural drainage water on individual farms (targeted number: 1000), c) extensification of intensively farmed lowland areas with carbon rich soils, d) natural water levels and preparation for grazing, primarily in Natura 2000 sites. Eligibility criteria for proposed projects are defined in national legislation. Under current regulation, N wetlands are required to reduce emissions of at least 90 kg nitrogen per hectare and year (in the past it was 113 kg (F. Bondgaard, pers. comm., 31.01.2018)), P wetlands shall be located upstream of lakes and reduce phosphorus loading by at least 5 kg P per hectare and year, and nature projects on carbon-rich lowlands ($\geq 12\%$ organic carbon) shall reduce at least 13 t CO₂ and 30 kg N per hectare and year (Miljø- og Fødevarerministeriet 2017). The reference for the cost-effectiveness assessment are implementation costs of € 175 per kg N and € 1948 per kg P (ibid.).

The Danish RDP provides funding for all aspects of wetland projects, i.e. implementation, maintenance and management⁵: A one-off payment covers up to 100 % of the investment costs (e.g. feasibility studies, land allocation, construction costs). Maintenance of high water levels is supported by compensating for the income lost due to abandonment or extensification of the previous land use, ranging from a payment per hectare of € 40 for natural areas up to € 467 for former arable/horticultural land over a commitment period of 20 years. This long term funding is stated to be necessary to guarantee optimal effects of the project and is justified by referring to Article 28, 5 Council Regulation (EC) No 1305/2013⁶. Additionally, annual payment is provided for the management of grassland or natural areas over a 5-year-funding period: mowing € 114 (€ 140) and grazing € 220 (€ 347) per hectare (in brackets: values for sites receiving no direct payments). Funding is input-based, but efficiency is improved by project selection according to the location in target areas of the Water Framework Directive (WFD), benefits for biodiversity or carbon storage.

There is an increasing focus on the potential environmental benefits of paludiculture in Denmark – as a measure for reduction of nutrient losses and GHG emissions from agricultural production (B. Stoltze Kaspersen, pers. comm., 14.06.2017; SEGES 2017). However, at the moment there is no specific funding available for supporting the implementation of paludiculture in Denmark as agri-environment-climate measure.

⁴ https://ec.europa.eu/agriculture/sites/agriculture/files/rural-development-2014-2020/country-files/dk/factsheet_en.pdf

⁵ http://naturerhverv.dk/fileadmin/user_upload/NaturErhverv/Filer/Tvaergaende/EU-arbejdet/LDP_GODKENDT_101214.pdf

⁶ Agri-environment-climate: “Commitments under this measure shall be undertaken for a period of five to seven years. However, where necessary in order to achieve or maintain the environmental benefits sought, Member States may determine a longer period in their rural development programmes for particular types of commitments.”

3.4.2 Germany

MoorFutures® - Credits from peatland rewetting for regional carbon markets [private-voluntary]

The MoorFuture standard was launched in 2010 to support peatland restoration in Northeast Germany. Developed in Mecklenburg-Western Pomerania, the approach meanwhile has been transferred to the federal states of Schleswig-Holstein and Brandenburg⁷. MoorFutures were the first carbon credits from peatland rewetting on the voluntary market in the world and provide one of few result-orientated payments for peatland ecosystem services. Companies, public institutions and individuals can buy carbon credits for voluntary offsetting of carbon emissions. The price is determined by the costs of the specific rewetting project and thus differs with currently € 35 / 54 / 67⁸ per mitigated ton CO₂-eq. Together with carbon mitigation, a bundle of other ecosystem services and biodiversity is improved by rewetting. In a research project, MoorFutures-Version 2.0 have been developed which quantify the improved water quality, flood mitigation, increased groundwater store, evaporative cooling and increased mire-typical biodiversity (Joosten et al. 2015), but they are not yet on the market. MoorFutures have been used for small and medium-sized peatland restoration going along, so far, with the abandonment of agricultural use. Approaches for combining MoorFutures with paludiculture are discussed, but not yet elaborated.

Bavaria

Conversion to and management of grassland with co-funding of CAP Pillar 2 [public]

In Bavaria, support for an extensification of peatland agriculture is provided by the programme for the cultural landscape ('KULAP', operated by the Ministry of Agriculture, funding: EU, federal government, Bavaria) and the contract-based nature conservation programmes ('VNP', operated by the Ministry of Environment, funding: EU, Bavaria)⁹. The conversion of arable land into meadows (VPN) or into grassland along water bodies (KULAP) is supported with € 370 per hectare, and on peatlands (KULAP) with € 570 per hectare. In 2015, the conversion of 246 ha of arable used peatlands was applied for, i.e. ca. 0.5 % of eligible area (Bayrischer Landtag 2016). Extensive grazing of valuable habitats with sheep, cattle and also water buffalos, which can graze on wet grasslands with low-quality fodder, is supported with € 310 per hectare (VPN). Mowing schemes for valuable habitats are supported with € 230-425 per hectare, depending on the harvesting date, and can be complemented with add-on measures e.g. a bonus payment compensating for the wet conditions of wet meadows and litter meadows (€ 80 per ha) or for the application of special machinery (€ 120-270 per ha) (Freese & Keelan 2017). Since 2015, the extensive use of valuable habitats is supported on 11,551 ha and the wetness bonus paid for 4995 ha of grassland on peatland (Bayrischer Landtag 2016).

Reducing CO₂ emissions from peatlands with co-funding of ERDF [public]

Bavaria uses co-funding of the European Regional Development Fund (ERDF) to finance climate mitigation and adaptation measures¹⁰, i.a. in the land use sector. Focus is on reducing CO₂ emissions from carbon rich soils, including planning, project management, rewetting measures and accompanying research. Funding is also provided for pilot projects testing land use options adapted to high water levels of rewetted peatlands, e.g. the project "MOORuse – paludicultures for fen soils in Bavaria – Establishment, climate relevance, environmental effects, utilisation options and profitability"¹¹.

⁷ www.moorfutures.de

⁸ inclusive VAT: € 35 / 64 / 80 per mitigated ton CO₂-eq

⁹ www.stmelf.bayern.de/agrarpolitik/foerderung/001007/index.php

¹⁰ www.efre-bayern.de/klimaschutz/

¹¹ www.hswt.de/forschung/forschungsprojekte/vegetationsoekologie/mooruse.html

Brandenburg

Fixed weir: peat conserving water retention on grassland [public]

With the current EU funding period, Brandenburg introduced a new agri-environment-climate measure to reduce GHG emissions from agriculturally used peatlands¹². Farmers need to fix the weir in drainage ditches to allow high ditch water levels of -10 cm below average ground level. The ditch water level can be lowered to -30 cm during summer (01.06. to 15.10.). The federal state used EU funding for technical advice (Article 51, Table 3) to engage an external service provider supporting farmers with the application process, e.g. obtaining a water law permit for the fixed wear. The agreement period is five years with an annual payment rate of € 387 per ha. Applications have been accepted for 426 ha in 2016 (first year) and another 438 ha in 2017, 55 % of all applications were rejected by the verifying authority. Major reasons for a site not to qualify for funding were a lacking possibility to retain water, a water level determined by a third party (e.g. drainage to federal waterway) and the site being classified as near natural peatland or as a peatland with a good restoration status. To increase the funding rate, information activities were improved in 2017. (L. Landgraf, pers. comm., 15.01.2018)

Conversion of arable land into grassland [public]

Brandenburg supports two options of increasing grassland area and reducing negative impacts on climate, water and soil¹²: a) using strips of arable land (width of 10-50 m) on special identified sites along water bodies or sites at risk of water erosion as extensive grassland during a 5-year commitment period (€ 270 per ha and year), and b) the permanent conversion of arable land into extensive grassland on peatlands (€ 1300 per ha and year paid over 5 years).

Reducing CO₂ emissions from peatlands with co-funding of ERDF [under appraisal]

A new funding scheme (ProMoor) is under elaboration for reducing GHG emissions from organic soils (≥ 15 % organic carbon) by supporting the successive adaptation of land use practices as well as the development of innovative approaches for climate smart agriculture (L. Landgraf, pers. comm., 08.03.2018). The scheme aims to preserve and restore the function of organic soils as carbon store, as filter for pollutants and nutrients and for the storage of water. ERDF funding shall be provided for measures supporting a) the implementation, e.g. scientific studies or advice and concepts for farm enterprises, b) the adaptation of practices, e.g. retrofitting of existent machinery, purchase of new or used machinery, purchase of adapted livestock species/ breeds, purchase of seeds or seedlings of adapted plant species/breeds as well as developing and testing machines and techniques to reach application maturity, c) rewetting, e.g. raising water levels by blocking ditches and construction, modification or removal of water-retaining structures, and d) the purchase of land. Funding of the eligible costs (e.g. related to preparation, monitoring, mediation, and investment) shall be provided for 80 % in case of demonstration projects and for 40-45 % of the costs in case of economic projects. Land purchase can be supported with a maximum of 10 % (15 % on fallow land) of the total investment costs. A scoring system with a minimum threshold has been developed to evaluate the efficiency of proposed projects.

Lower Saxony

Measures with co-funding of CAP Pillar 2 [public]

EAFRD funding (Pillar 2) is used for the measure „Land management for climate and environment“ in order to rewet peatland sites located within the area “Carbon rich soils with climate protection potential” (ML Niedersachsen 2017). Support is provided for a) the purchase of land (either for rewetting or offered for

¹² www.mlul.brandenburg.de/cms/media.php/lbm1.a.3310.de/Richtlinie%20KULAP%202014_01-09-2017.pdf

exchange) and to cover costs of studies, and b) for land consolidation arrangements, including dismantling and construction of agricultural roads, – the rewetted peatland sites are, however, taken out of agricultural use. Advice to farmers (individual consultation) is supported for various topics as biodiversity, nutrient management and animal welfare, but also the advice on peatlands and land use on carbon rich soils offered by the Chamber of Agriculture¹³. Agri-environment-climate measures include the extensive management of grassland (€ 170 per ha), grassland management benefiting meadow birds, e.g. an extended rest period (until 20.06., € 205 per ha) and top-ups for backing up water/irrigation € 180-205 per ha and result based payments for species rich grassland in case of the occurrence of 4, 6 or 8 indicator species (€ 190, 220, 310 per ha) (Freese & Keelan 2017).

Reducing CO₂ emissions from peatlands with co-funding of ERDF [public]

ERDF funding is used to finance the funding scheme „Climate protection by peatland development – reducing GHG emissions from carbon rich soils“, which supports rewetting of peatlands, including implementation measures and preparatory measures (e.g. expert reports, consulting, round tables) as well as research and development of climate smart agriculture on pilot sites (e.g. MOOSWEIT -Sphagnum farming on former bog grassland¹⁴).

Mecklenburg-Western Pomerania

Measures with co-funding of CAP Pillar 2 [public]

EAFRD funding (Pillar 2) has been used for the “Support of the sustainable development of water bodies and wetland habitats” (2007-2013), including the rewetting of 2732 ha of peatlands with 513 ha aimed at developing wet grassland habitats (LM M-V 2017). The new funding scheme (2014-2020)¹⁵ provides “Support for nature conservation projects”, which addresses for instance studies and implementation to re-establish wetlands and peatlands and has a focus on Natura 2000 sites,¹⁶ as well as “Support for sustainable water management projects”, which shall contribute i.a. to the implementation of the Water Framework Directive and flood protection¹⁷. The management of valuable grassland habitats, e.g. very wet grassland (€ 450 per ha) and moist / wet grassland of nutrient poorer sites (€ 340 per ha), is supported, but the eligible peatland area is limited with 321 ha and 1136 ha, respectively, and the area applied for even smaller (524 ha in 2016) (LM M-V 2017). Support is also provided for extensive grassland (€ 105-220 per ha) and for the permanent conversion of arable land into grassland, which is compensated with € 1300 per ha and year over five years (Freese & Keelan 2017). The current RDP supports also advice to individual farmers by covering up to 90 % of eligible costs and in case of the first consultation 100 % of the costs (max. € 1500) (LU M-V 2015), including advice on climate smart agriculture on peatlands (climate mitigation, nature conservation and paludiculture) offered by the Greifswald Mire Centre¹⁸.

¹³ www.ml.niedersachsen.de/themen/landwirtschaft/agrarfoerderung/beratung_landwirtschaftlicher_betriebe/neue-themen-fuer-die-landwirtschaftliche-beratung-126966.html

¹⁴ www.sphagnumfarming.com

¹⁵ www.regierung-mv.de/serviceassistent/download?id=1570955

¹⁶ www.landesrecht-mv.de/jportal/portal/page/bsmvprod.psml?doc.id=VVMV-VVMV000008671&st=vv&doctyp=vvmv&showdoccase=1¶mfromHL=true#focuspoint

¹⁷ www.landesrecht-mv.de/jportal/portal/page/bsmvprod.psml?showdoccase=1&doc.id=VVMV-VVMV000008402&st=vv

¹⁸ <https://greifswaldmoor.de/advice-for-farmers.html>

Schleswig-Holstein

Measures with co-funding of CAP Pillar 2 [public]

Non-productive investments for nature conservation, e.g. land purchase and restoration measures, are financed with 100 % of the eligible costs by the RDP¹⁹, particular focus is on peatland conservation. Additionally, water management measures are co-funded by the EAFRD and may include for instance the rewetting of peatlands to improve water retention in the landscape or water quality²⁰. Contract-based nature conservation measures include “Pasture farming on peatland” (€ 260 - 340 per ha) and “Grassland management on peatland” (three requirements levels: ‘green’ € 40 / 120, ‘yellow’ € 290 / 300, ‘red’ € 500 per ha). Both schemes require not to lower the water level. Additionally, the second option requires to take part with at least 90 % of the grassland area of the farm and at least 10 % of the participating area should be managed according to the highest requirement level (‘red sites’) including temporary rewetting (at least 10 % of open water in spring) in combination with extensive grazing or late mowing to create especially attractive breeding grounds for meadow birds²¹.

Water extraction fees and waste water levy [private-compulsory]

Schleswig-Holstein is a good practice example for using levies charged for ground water extraction, surface water and sewage water to co-finance different measures contributing to the implementation of the Water Framework Directive. In 2006, total funds of € 48.9 million were spent for e.g. water protection, improving water quality, restoration and conservation contract management, with a small portion of € 175.000 directly used to finance the rewetting of fens (Grüne Liga 2007). Taxes and levies are instruments for internalising environmental and resource costs and provide incentives for more efficient and considerate water use, but additionally they generate considerable financial recourses for water protection measures (Grüne Liga 2011).

3.4.3 Netherlands

The Dutch governmental subsidy system is called ‘Nature & Landscape’ (SNL). The eligibility of an area for subsidies is determined by provincial nature management plans (maps of current status and ambitions). Three components are distinguished: a) ‘nature types’, b) agricultural ‘nature types’, c) landscape elements.²²

‘Nature types’ [public]

Support for ‘nature types’ is financed only by national money and encompasses a) management, b) improvement (transforming a management type into another management type or improving the quality of a management type) and c) purchase and development of former agricultural land. A number of 47 management types are distinguished, e.g. swamp, mown reedbeds, bogs and moist meadow bird grassland. Support is provided e.g. for the traditional harvest of thatching reed (ca. € 500 per ha and year). Payment heights consider revenues from selling biomass or soil (sod cutting of peat or plaggen as restoration measure) derived from habitat management and can differ slightly between provinces and also between years. Funding for the management type “Still to transform into nature” aims at developing habitats and can include e.g. blocking ditches and rewetting of peatlands. After one funding period (six years), payments are provided according to the target (or reached) management type. If a farmer wants to transform agricultural land into land with a ‘nature’ target, he remains the owner of the land and is compensated for the decreased value of land with a

¹⁹ www.schleswig-holstein.de/DE/Fachinhalte/F/foerderprogramme/MELUR/LPLR/Downloads/lplr19072017.pdf?__blob=publicationFile&v=2

²⁰ www.foerderdatenbank.de/Foerder-DB/Navigation/Foerderrecherche/suche.html?get=6f30e7ddc4905846ffb429291a9bd4e7;views;document&doc=8964&typ=RL

²¹ www.schleswig-holstein.de/DE/Fachinhalte/V/vertragsnaturschutz/Downloads/Gruenlandwirtschaft_Moor.pdf

²² www.bij12.nl/onderwerpen/natuur-en-landschap/index-natuur-en-landschap/de-index-natuur-en-landschap/

one-off payment. Payment height can be up to 85 % of the market value of e.g. € 30,000-80,000 per ha, which is assessed according to soil quality, accessibility, plot size and drainage conditions. Compensation rate is lower if an utilisation of the land will still be possible (e.g. transferring a pasture into a meadow), but the land will not be eligible any more for agricultural subsidies.

Agricultural Nature + Landscape Management (ANLb) [public]

The management of agricultural 'nature types' is co-financed by the European Rural Development funding. Since 2016, regional cooperation is compulsory. Only agrarian collectives can apply for subsidies for their area, individual applications are not eligible. The aim is to improve effectiveness and efficiency of agri-environment-climate-measures, which are also called "green-blue services". Focus lies on the management of four agricultural habitats to benefit species of international importance (Birds and Habitat Directives) and on water management (quality, rewetting, and retention).

Major support is provided for instance for the management of grassland for meadow birds²³ within different packages, e.g. ensuring a rest period during the nesting phase (from 01. April) or later for growing up the chicks (starts earliest on 01. May) or extensive grazing where birds can both breed and forage. Interested farmers are required to participate in a collective management plan that combines the different management types of the packages and which is managed by an area coordinator. Rest periods of different lengths during nesting phase are remunerated with € 275 (01.04.-01.06) up to € 1376 (01.04-01.08) per hectare. These payments can be topped up by a bonus for high water level during the period 01.02.-15.06, a) 20 - 40 cm below average surface: € 91 or b) 0 - 20 cm below surface: € 181 per hectare, aiming at better soil life, slowing down grass growth and a more diverse vegetation structure. Another measure is the inundation of grassland (5 to 20 cm above surface) on at least 60 % of the management unit in order to attract birds, e.g. from 15.02.-15.06, remunerated with € 1981 per hectare. Combining different management activities on grassland can lead to payments as high as ca. 2400 € per hectare and year.

The water category (cf. Bij 12 n.d.) provides support for management measures that improve water quality or increase water storage capacity. The provinces are in charge of the area process, i.e. mapping the possibilities for the area and determining the most suitable management measures, and involving water boards, collectives and their participants. If a local situation requires specific management, a new management package can be developed. The provinces also make agreements with the water boards concerning the national co-funding, which is necessary for receiving EU subsidies. Four management functions are distinguished: water storage, improve water quality, rewetting, water retention. Measures can include reducing / preventing drainage and leaching of nutrients or crop protection agents to ground and surface water through management of, among others, purification swamps²⁴. It is acknowledged that higher water levels may require the cultivation of other, more water-tolerant agricultural crops and / or accepting a decline of crop yield or quality²⁵.

²³ www.bij12.nl/onderwerpen/natuur-en-landschap/index-natuur-en-landschap/de-index-natuur-en-landschap/agrarische-natuurtypen/a01-agrarische-faunagebieden/a01-01-weidevogelgebieden/

²⁴ www.bij12.nl/onderwerpen/natuur-en-landschap/index-natuur-en-landschap/de-index-natuur-en-landschap/agrarische-natuurtypen/w01-waterbeheergebieden/

²⁵ www.bij12.nl/onderwerpen/natuur-en-landschap/index-natuur-en-landschap/de-index-natuur-en-landschap/agrarische-natuurtypen/w01-waterbeheergebieden/w01-01-agrarisch-waterbeheergebied/

3.4.4 Sweden

Construction and restoration of wetlands [public]

The construction and restoration of wetlands have been a Swedish agri-environment target during the EU-funding periods 1996-2020. Since 2009, an additional, national programme supports municipalities and non-profit organisations in implementing local water conservation projects (LOVA), including reducing eutrophication by the construction of wetlands²⁶.

The payment via RDP²⁷ covers in general 90 % of the eligible investment costs (max. € 20,473 per hectare). If environmental benefits are especially high 100 % of costs can be covered, if the benefit is limited or if there is a benefit for the farm 50 % of costs are covered. For selecting project sites, there is a total of ca. 100 different criteria defined in action plans on county level (E. Svensson, pers. comm., 26.09.2016). Main focus is on the retention of nutrients, i.e. nitrogen and phosphorous, as well as on enhancing biodiversity. Criteria shall increase efficiency of limited funds, e.g. optimal placement and design of the wetland for high nutrient retention, and take co-benefits into account, e.g. recreational values or flood control. Peatland rewetting is not in focus, but reducing greenhouse gas emissions from organic soils can provide additional scores in assessing a planned project. Some counties use a report on GHG emissions from peatlands (Hjerpe et al. 2014) as reference for this selection criteria.

Maintenance support is provided over a 5-year commitment period to ensure functioning of the established wetland, e.g. maintenance of wells, pipes, dikes and removing vegetation, amounting to € 409 per hectare and to compensate for the reduced land value with a payment of € 102 per hectare or € 409 per hectare considering higher land values in Southern Sweden.

Adjustable / Controlled drainage [public]

Declared as support for non-productive investments linked to achieving environmental and climate objectives in agriculture, the Swedish RDP²⁷ supports the installation of control wells in drainage systems to regulate the ground water table. The target is to increase the retention of nitrogen in arable soils and thereby reduce eutrophication of lakes, rivers and seas as well as to improve water availability during dry periods. Funding is available for nitrate sensitive areas. It is stated, that wells can be dammed to raise water levels in periods with low drainage requirements, - however, no water level targets are prescribed (compare Finland). Fixed one-off payments of € 819 per well are provided, based on costs of project planning, material (well and connecting pipe) and installation.

Support for cooperation in the environment [public]

Support is provided for environmental cooperation, e.g. cooperation for developing and implementing projects at the landscape level, aiming at preserving biodiversity, improving water quality, or for sustainable use. Aid may be granted for working time needed to complete the project (salary, own work, services of third parties), for other expenses as for instance printing materials, meeting rooms or travel costs and also for transnational cooperation with other Member States as a complement to an already approved project. Funding can be provided for 90 % of the eligible costs.

²⁶ www.havochvatten.se/hav/vagledning--lagar/anslag-och-bidrag/havs--och-vattenmiljoanslaget/lova.html

²⁷ www.jordbruksverket.se/download/18.229ea55815233ba0390e8c59/1452694447806/Landsbygdsprogrammet%202014-2020.pdf

Rewetting agricultural land on organic soils [under appraisal]

The Swedish Government commissioned the Swedish Board of Agriculture, which is the national authority responsible for agriculture and rural development in Sweden, to investigate the possibilities and consequences of rewetting agricultural land on organic soils. The objective is to investigate and, if possible, suggest policy instruments that could be used to create incentives for rewetting organic soils in order to reduce GHG emissions. Sweden has experience with creating wetlands in order to reduce nutrient leaching or increase biodiversity (see above), but not for effectively reducing GHG emissions. Appropriate site selection and design, practical solutions, costs and suitable policy instruments are considered as questions still to be resolved. In September 2018, results shall be delivered to the government that will decide if and how a possible incentive for actions will be realised. (L. N. Hjulfors, pers. comm., 18.12.2017).



Climate smart agriculture requires harvesting machinery adapted to the low bearing capacity of wet and rewetted peatlands and benefits from machines that have been developed for the large-scale management of valuable wetland habitats or for the traditional reed harvest.

3.5 Examples from other countries

3.5.1 Estonia

Habitat management and soil protection [public]

The Estonian RDP provides funding for the maintenance of semi-natural habitats which are mainly located in Natura 2000 areas (98 %) and include ca. 8500 ha of habitats on peat soils (Peters & Unger 2017). Grazing and mowing measures are rewarded with e.g. € 250 and € 185 per ha and year, respectively²⁸. As regional soil protection measure (outside Natura 2000), funding of € 50 per ha and year is provided for managing peat soils as permanent grassland or for growing fruit trees and berry plants on arable land, if at least 90 % of the land parcel has peat soil. Furthermore, only those farmers are eligible for funding that accepted to comply with further restrictions of the environmentally friendly management scheme (basic support: € 50 per ha and year)²⁸. While construction and renewal of drainage infrastructure can be supported, drainage areas having at least 30 % of peat soil with at least 1 m depth are excluded from funding. (Peters & Unger 2017)

3.5.2 Finland

Adjustable / Controlled drainage [public]

In Finland, agri-environment-climate payment is provided for the installation and management of control wells to control sub-surface drainage (K. Regina, pers. comm., 15.12.2017). The target is to reduce GHG emissions and improve water quality by raising the water table during the growing season or at least after harvest. This agri-environment-climate measure could be used to start paludiculture since it allows not only to raise but also to control the water table, thus avoiding problems that may occur with a field with blocked drains not fulfilling the current requirement for agricultural land due to flooding. However, there is no commitment to raise the water table and it is not known how the farmers use the control. One-off payment is provided for the investment (€ 250 per ha) and annual payment for the maintenance (€ 70 per ha).

3.5.3 Italy

Province of Bolzano-Bozen

Habitat management [public]

In Italy, 20 provinces elaborated separate RDPs. The Province of Bolzano included agri-environment-climate measures for managing peatland habitats and maintaining traditional land uses (Autonome Provinz Bozen 2016). Payments for fen meadows amount to € 660 and € 440 per hectare within and outside Natura 2000, respectively, and can be topped up with € 200 in case of difficult management. Mowing of reed beds is supported with € 810 and € 530 per hectare in dependence of location within or outside Natura 2000.

3.5.4 Poland

Peatland and breeding habitats [public]

With the funding period 2007-2013/2014, Poland introduced agri environment schemes to support mowing or grazing of precious grassland habitats. Within targeted packages, sites were only eligible for payments if an accredited expert provided environmental documentation on the value of the habitat type (e.g. small and large sedge reeds, purple moor grass meadows, semi-natural wet meadows; € 200-350 per ha) or on the breeding of endangered bird species (e.g. Aquatic warbler, Curlew, Dunlin; € 300-350 per ha) (Jobda 2008,

²⁸ www.agri.ee/et/eesmargid-tegevused/eesti-maaelu-arengukava-mak-2014-2020

Żmihorski et al. 2016). In the period of 2007-2014, nearly € 450 million were spent on the grasslands AES, of which more than € 280 million were spent on the breeding habitats of grassland birds with an area of almost 314,000 ha (Żmihorski et al. 2016). These payments provided incentives for land managers to invest in technique (adapted snow groomer) suitable for large-scale mowing and harvesting of several thousands of hectares of wet peatland, e.g. in Biebrza and Narew river valleys.

In the funding period 2014/2015-2020²⁹, funding for valuable grassland habitats and threatened bird species continues in Natura 2000 sites (package 4), but outside of Natura 2000 sites is limited to habitat management (package 5). Payments per hectare were reduced, ranging for bird species from € 154 (Corncrake) to € 288 (Aquatic warbler) and for habitat management from € 144 to € 312. Payments decrease with the size of the area: 100 % up to 50 ha, 75 % for 50 -100 ha and 60 % of the basic rate for an area over 100 ha. For Natura 2000 sites located within National Parks, no thresholds apply. It is prohibited to create new and extend or reconstruct existing drainage systems, - with the exception of using the existing drainage system for adjusting the water level to meet habitat requirements. Recent research results suggest that wetness and occurrence of temporarily flooding are key features for the conservation of Polish waders (Żmihorski et al. 2018). However, no water level targets are set and no additional payments for raising the water level are provided.

3.5.5 UK

UK Peatland Code [private-voluntary]

The Peatland Code is a voluntary standard for UK peatland restoration projects. It allows to market climate benefits from peatland rewetting. The standard is issued by the IUCN UK National Committee. Currently, first Peatland Code projects are undergoing validation according to Peatland Code Version 1.1 launched in March 2017³⁰. Projects wishing to become validated must meet basic pre-requisites as the peatland type (blanket or raised bog), a minimum peat depth (> 50 cm) and degrading conditions ('Actively Eroding' or 'Drained'). Projects in fen peatland systems shall be included in future as more data becomes available on the carbon benefits. The peatland code attests the carbon benefits, not other benefits of peatlands restoration. An independent body conducts validation of planned projects and predicted GHG emissions reductions as well as ongoing verification. The landowner of a validated project is responsible for the carbon sale and for the contracts with buyers (an individual, a business or a fund). In return for investing in a restoration project, a buyer receives Pending Issuance Units, which have an associated timeframe for delivery. After verification, delivered units are transferred to verified Peatland Carbon Units.

England

Environmental Stewardship Scheme / Countryside Stewardship Scheme [public]

The Environmental Stewardship Scheme (ES) was a 10-year scheme, running from 2005 – 2014, which has meanwhile been closed to new applicants. The scheme had an entry level (ELS) open to all farmers (5 years agreement) and a more targeted higher level (HLS, 10 years agreement). HLS provided a wide range of options for the management, restoration and creation of peatland habitats³¹. The uptake in lowland peatlands (e.g. wetland cutting and grazing with 166 agreements on 1179 ha of fen, reedbed or lowland raised bog) was by far less than for the uplands (e.g. moorland restoration with 238 agreements on 85,126 ha) (Keenleyside & Moxey 2011, data for the year 2008/09).

²⁹ www.minrol.gov.pl/content/download/61409/337263/version/1/file/Program%20Rozwoju%20Obszar%C3%B3w%20Wiejskich%20na%20lata%202014-2020.pdf

³⁰ www.iucn-uk-peatlandprogramme.org/peatland-code/code-information

³¹ 4th edition of the HLS handbook, 2013: <http://publications.naturalengland.org.uk/file/2819648>

The Countryside Stewardship Scheme (CS)³², launched with the new EU funding period (2014-2020), distinguishes three main elements: Mid Tier, Higher Tier as well as Capital grants. Higher Tier are generally 5 years in duration, however, certain options can run for 10 years, e.g. creation of reedbeds and the raised water supplement. In addition, a facilitation fund is set up as targeting and competitive element. The fund provides incentives for developing cooperation of land managers at landscape scale in order to enhance the provision of environmental benefits. Applications undergo a scoring process, including a value-for-money assessment and those with highest scores will be offered agreements. The facilitator can receive annually up to £ 10,000 (€ 11,300) for costs of delivering the cooperation and £ 500 (€ 565) per holding involved³³. CS continues several support options for peatland management, whereby detailed requirements will be tailored to the specific Higher Tier site, e.g.:

- Management of moorland: € 49 per ha and year
 - + moorland re-wetting supplement: € 20 per ha and year
 - + grip blocking drainage channel: € 17 per block
- Management of reedbeds / fen / lowland raised bog: € 88 / € 44 / € 186 per ha and year
 - Creation of reedbeds / fen: € 506 / € 366 per ha and year
 - + wetland cutting or grazing supplement: € 500 / € 345 per ha and year
 - + raised water level supplement: € 144 per ha and year
 - + construction of water-penning structures: up to 100 % of costs

Some of the payment rates appear quite attractive, especially where various options, supplements and additional capital works are used on the same area of land, and where the Basic Payment Scheme is still being claimed. The regulatory burden, however, increased including the need for evidence to be compiled to support an application, the need for strict records regarding the management and inspections focussing on the compliance with the exact detail of the agreement rather than the overall outcome (I. Wrigley, pers. comm., 15.12.2017). It seems that many farmers in England are starting to regard agri-environment schemes as too much trouble and not worth applying, - or at least rely on support by a professional agent

United Utilities - SCaMP [mixed: public & private]

The water and wastewater company United Utilities (UU) set up their “Sustainable Catchment Management Programme” (SCaMP³⁴) in 2005, which was the first PES financed by the UK water industry (Matzdorf et al. 2014). Measures have been implemented on UU owned catchment land in Northwest England, consisting primarily of upland moorland (DEFRA 2013). The PES scheme aims at protecting and improving the water quality to avoid additional water treatment, but a range of co-benefits are also of interest, e.g. enhancing flood protection, carbon storage, biodiversity and recreation (ibid.). Financing is provided by UU customers through minor increases of their water bills and partly covered by public agri-environment payments within the Stewardship Schemes (see above). For SCaMP 1 (2005-2010), UU invested ca. € 12 million in moorland restoration, woodland management, farm infrastructure improvements and watercourse protection across 27,000 ha in the Peak District and the Bowland, followed by SCaMP 2 (2010-2015) with an investment of ca. € 13 million across 30,000 ha in Cumbria and South Lancashire³⁴. SCaMP 3 (2015-2020) extends investment also to non-owned catchments using drinking water safeguard zones designated by the Environment Agency to target measures, advice and incentive schemes for land managers³⁴.

³² www.gov.uk/government/collections/countryside-stewardship-get-paid-for-environmental-land-management

³³ www.gov.uk/government/uploads/system/uploads/attachment_data/file/641188/cs-guide-to-facilitation-fund.pdf

³⁴ www.unitedutilities.com/corporate/responsibility/environment/catchment-management

South West Water - Upstream thinking [private-voluntary]

The private company South West Water (SWW) manages a water and wastewater network serving nearly 600,000 customers in South West England and finances several projects to ensure water quantity and improve water quality in their catchment area (Matzdorf et al. 2014, Leonardi et al. 2017). Upstream thinking³⁵ is an umbrella initiative that include different payments for watershed services aiming at improving water quality to reduce water treatment costs for SWW, but also contributing to climate change mitigation and biodiversity conservation. The budget was nearly € 12 million for 2010-2015, and another € 12 million have been budgeted for 2015-2020 for a programme that focuses on 11 catchments across Devon and Cornwall (Leonardi et al. 2017). As of 2016, 1948 ha of moorland have been restored, and the target for the next period is 3000 ha (ibid.)

Scotland

Measures with co-funding of CAP Pillar 2 [public]

The Scottish Agri-Environment-Climate Scheme³⁶ is a competitive scheme with multiple objectives: protect and enhance biodiversity, improve water quality, manage flood risk, mitigate and adapt to climate change, improve public access and preserve historic sites. Most management options have been spatially targeted; an online “Targeting tool”³⁷ allows interested farmers to enter their Holding Code in order to identify those options they can apply for. A Farm Environment Assessment covering the whole holding is a prerequisite for application, but funding to help with the costs can be claimed increasing with area involved and specialist knowledge (e.g. peatland management) needed. A scoring system rewards e.g. actions with long term benefit and cooperation. Peatland related options are for instance:

- Moorland management with livestock: € 4 per ha and year
- Lowland bog management, without / with grazing: € 42 / € 102 per ha and year
- Wetland management / wetland creation & management (fen meadow, reed beds, salt marsh): € 91 / € 323 per ha and year
- Management of buffer areas for fens and lowland bogs: € 355 per ha and year
- Ditch blocking with peat dam: € 15 per dam, with a minimum payment of € 340
- Ditch blocking with plastic pilling dams: € 70 / € 171 / € 437 per dam (depending on width)
- Field drain breaking: € 51 per break
- Moving or realigning ditches: actual costs
- Stock bridges (allow livestock to access grazing areas) small / large: € 252 / € 998 per bridge

In addition, forestry grant schemes can be used. The Woodland improvement grant supports restoration of non-woodland habitats such as lowland raised bogs and blanket bogs, e.g. combining woodland clearance (felling and extraction: € 1587 per ha) with ditch blocking (see above).

Wales

Glastir [public]

The Welsh Sustainable Management Scheme “Glastir”³⁸ (Welsh: “Green land”) was launched in 2012, replacing several previous governmental schemes (Rose 2011). Glastir provides entry / lower level agri-

³⁵ www.upstreamthinking.org

³⁶ www.ruralpayments.org/publicsite/futures/topics/all-schemes/agri-environment-climate-scheme/agri-environment-climate-scheme-full-guidance-menu/agri-environment-climate-introduction/

³⁷ <http://targeting.ruralpayments.org/>

³⁸ <http://gov.wales/topics/environmentcountryside/farmingandcountryside/farming/schemes/glastir/?lang=en>

environment schemes for farms (All Wales Element) or for collaborative action on common land (Common Land Element) as well as selective advanced / higher level AES for farms and commons (Targeted elements). Major targets are combating climate change, improving water management (quality and quantity) and maintaining/ enhancing biodiversity. Participants of the entry level AES may express their interest to join the advanced level scheme. The Welsh Government selects suitable participants based on target maps. For the Targeted Element Carbon the map shows areas of priority 1-3 in uplands and in lowlands, essentially those soils identified as organic soils (Keenleyside & Moxey 2011).

Since a modelling approach allows scoring land holdings according to their ability to provide benefits and identifying the measures best suited to contribute to reaching the targets, Reed et al. (2014) describe Glastir as an example of good practise for an evidence-based and efficient AES. As prescribed by the CAP regulatory framework, payments are provided for management measures and capital works based on the input (costs or income foregone), but it is discussed to provide additional outcome-based payments via private PES schemes (ibid.). Selected examples³⁹ for management options, additional management payments and for capital works on carbon rich soils are:

- Grazing management of open country (e.g. uplands): € 65 per ha and year
- Management of lowland marshy grassland with mixed grazing: € 134 per ha and year
- Reedbed creation: € 452 per ha and year
- Additional management payment for maintaining rewetting: € 28 per ha and year
- Breaking up field drains: € 24 per item
- Grip blocking: € 140 per item

Pumlumon Project [mixed: public & private]

The project started in 2007 and is a good practise example for PES (cf. DEFRA 2013; Matzdorf et al. 2014). Led by the Montgomeryshire Wildlife Trust (MWT), the project provides payments for increasing and maintaining the provision of upland ecosystem services of the Cambrian Mountains focussing on carbon storage, water quantity (reduced flood risk), water quality (drinking water) and wildlife (MWT n.d.). MWT uses environmental data for deciding what and where to do at first and monitors the success of the measures. Measures include blocking ditches to restore hydrology and to remove point source and diffuse pollution. Farmers decide whether they want to block ditches themselves or MWT pays a contractor for the work. Furthermore, the grazing regime is changed to improve the upland management: Cattle is used instead of sheep, at moderate intensities and at appropriate time of the year. Payments are provided annually (€ 57 per ha), a rate set similar to governmental AES payments for habitat management (grazing of open country). Additionally, farmers can derive higher market revenues for “conservation beef”, e.g. via entering a scheme entitled “Wildlife Trust Wales approved products”. Diversification of local income opportunities is another aim of the project, e.g. via tourism benefiting from improved wildlife. For instance, MWT could accredit private businesses and recommend B&B to tourists as in the tourism sector much more money can be generated than in the agricultural sector (L. Lewis-Reddy, pers. comm., 16.01.2017). The Pumlumon project is supported by the Welsh Government, statutory agencies as Natural Resources Wales, charities as Waterloo (the charity arm of an insurance company) and funds as Biffa Award (utilises landfill tax credits donated by Biffa Waste Services, managed by the Royal Society of Wildlife Trusts).

³⁹ <http://gov.wales/docs/drah/publications/170306-glastir-advance-target-checker-en.xls>

Post-Brexit

The UK has been a pioneer in acknowledging the importance of peatland ecosystem services beyond biodiversity, quantifying the societal costs of degraded peatlands and providing money for restoration. Wales, Scotland, England and Northern Ireland have already been using the co-funding via CAP Pillar 2 to finance extensive agri-environment-climate measures for restoring and managing peatlands and included targeting and competitive elements to increase efficiency. Reed et al (2010) identified policy options for an increased support of the sustainable management of UK peatlands, including information provision, knowledge exchange and capacity building, improving the link between agricultural payments and the provision of ecosystem services, encouraging collaboration between peatland stakeholders and complement government financed agri-environment schemes with assessing private finance via the creation of new markets.

The Brexit is a challenge for future peatland restoration projects, being cut-off from EU LIFE funds, and also for peatland farmers depending on income securing CAP payments. However, Brexit brings as opportunity the independence of EU CAP restrictions and allows redesigning future rural payments. Instead of predominant area-based payments (Pillar 1) and much less money assigned to agri-environment-climate measures that compensate costs or income foregone (Pillar 2), real outcome may be remunerated to allocate public funds to public goods. The IUCN UK Peatland Programme developed ten recommendations for supporting healthy and sustainable peatlands after Brexit⁴⁰, including a) funding for restoration and sustainable management of peatland (relating payments to public benefits, need of long-term commitments to give land managers confidence to move from damaging to good practices), b) incentives to support private investments (complementary to public funding in enabling restoration and long-term sustainable management), c) control of harmful management practices (avoid incentives for land management damaging peatlands, regulation and prohibition of practices such as drainage of deep peat) and d) encourage the transition of drained peatlands under productive use to wetter farming (set policy direction, develop farm support, trials, advocacy). By implementing these points, the government can confirm and enhance UK's pioneering role in the protection, restoration and sustainable management of peatlands.

⁴⁰ www.iucn-uk-peatlandprogramme.org/resources/peatlands-after-brexit?destination=node%2F277

3.6 Stakeholder aspects

To ensure acceptance of economic incentives for climate smart agriculture on peatlands, farmer's perception of peat soils and of the possible introduction of paludiculture need to be considered. Within the Cinderella project, Anna Hansson (Halmstad University /Sweden) conducted interviews with farmers about function and business considerations connected to their cultivated peatlands. Following major results were elicited, but analysis is still in progress (A. Hansson, pers. comm., 09.02.2018):

- Business decisions are mainly based on monetary concerns, such as increasing income and avoiding threats to the businesses financial security. If revenues will be sufficient, there is a willingness to try new alternatives, especially if current activities on the peatland are perceived as financially unstable long-term.
- The share of peatland affects decision making and perceived risks. Farmers with a larger share of peatland are more open to try new alternatives since the function of their peatland has a greater impact on farm revenues. However, as long as current activities are functioning and profitable, most do not see any reasons for changes at present.
- Decisions about new alternatives are mostly profit driven and based on trial-and-error or knowledge received from other farmers or advisors. Farmers expressed a lack of knowledge on alternative peatland activities and their profitability. They preferred small changes, which were connected with smaller business risks, as well as keeping the tradition of food production, which is also related to feeling responsible to provide food to a growing population.
- A strong dissatisfaction was expressed with bringing water back into the soils that have been drained during several generations. It was difficult to see what the profit would be, other than the one for the environment, since there currently is no or very limited market demand for paludiculture crops and the prospects are unclear.
- All farmers stated that subsidies play an important part in their business decisions. They described the importance of continuity over time, both for the direct payments and agri-environment measures paid over usually 4-5 years, since the continuity guides them in their decision-making. They expressed that subsidies must support their need of long-term planning when it comes to business decisions. Most farmers described the time frame of 4-5 years as too short. Some explained how their farming advisors guided them in their decisions about land use change by suggesting new crops or farming techniques that would be supported by subsidies.

Based on these results on the perceptions of farmers, economic incentives for climate-smart agriculture on peatlands need to consider that:

- *Subsidies strongly influence farmer's business decisions by increasing/ensuring income*
Support for drainage based agriculture should be phased out since it prevents farmers from acknowledging the need for changes by ensuring profitability of current practices. Support for paludiculture needs to provide real incentives increasing income and reducing financial risks.
- *Farmers face a lack of knowledge on alternatives, but trust in experience of other farmers and advisors*
Information on alternative utilisation options need to be increased and should be spread by demonstration sites and advisors.
- *Current challenges of society are not realised, not the least because priorities are not incentivised*
Farmers feel responsible for feeding a world-wide growing population, but seem not be aware of the predominant role peat soils have for climate change being a major challenge in today's world. Education and advice need to communicate a positive image of a "carbon farmer". The priority shift from draining peatlands for food production to rewetting peatlands for saving the climate need to become credible by remunerating climate and environmental benefits and a time frame ensuring a sufficient continuity of support.

The long-term experience with (re-)establishing wetlands and lessons learnt in Sweden and Denmark may be useful in implementing paludiculture. Crucial aspects are the involvement of local key actors, developing long-term relationships with farmers, providing comprehensive support to farmers (information, advice, competitive funding), promoting multiple benefits and a catchment area approach (Andersson 2012, see also Hansson et al. 2012, Svensson 2014). The specific way of addressing and involving all stakeholders, however, need to consider the differences among countries and regions, e.g. the tradition and willingness of farmers to cooperate or experiences of rural communities with bottom-up processes.



Promising outlook: public appreciation of the multiple benefits of sustainable peatland use and attractive economic incentives facilitating restoration and paludiculture in the future.

4 References

- Andersson, K. (2012) Multifunctional Wetlands and Stakeholder Engagement: Lessons from Sweden. Stockholm Environment Institute, Working Paper No. 2012-08. 40 p.
- Autonome Provinz Bozen (2016) Entwicklungsprogramm für den ländlichen Raum 2014 – 2020. Verordnung (EU) Nr. 1305/2013. 48 p. http://www.provinz.bz.it/land-forstwirtschaft/landwirtschaft/publikationen.asp?publ_action=300&publ_image_id=397526
- Bayrischer Landtag (2016) Zustand und aktuelle Nutzung der Moorflächen in Bayern. Schriftliche Anfrage des Abgeordneten Florian von Brunn SPD vom 24.05.2016. Drucksache 17/12719 vom 30.09.2016, 6 p.
- Biancalani, R. & Avagyan, A. (eds.) (2014) Towards climate-responsible peatlands management. Mitigation of climate change in agriculture series, 9. FAO, Rome, 117 p. online available: <http://www.fao.org/3/a-i4029e.pdf>
- Bij 12 (n.d.) Water binnen het Agrarisch Natuur- en Landschapsbeheer (ANLb). Verbetering waterkwaliteit en waterbergend vermogen. 4 p. https://www.bij12.nl/assets/BIJ12_ANLb_Folder_Water.pdf
- Bonn, A., Reed, M.S., Evans, C.D., Joosten, H., Bain, C., Farmer, J., Emmer, I., Couwenberg, J., Moxey, A., Artz, R., Tanneberger, F., Unger, M. von, Smyth, M.-A. & Birnie, D. (2014) Investing in nature: Developing ecosystem service markets for peatland restoration. *Ecosystem Services* 9, 54–65.
- Carlson, K.M., Gerber, J.S., Mueller, N.D., Herrero, M., MacDonald, G.K., Brauman, K.A., Havlik, P., O’Connell, C.S., Johnson, J.A., Saatchi, S. & West, P.C. (2017) Greenhouse gas emissions intensity of global croplands. *Nature Climate change* 7, 63-68.
- Czybulka, D. & Kölsch, L. (2016) The legal framework. In: Wichtmann, W., Schröder, C. & Joosten, H. (eds.) (2016). *Paludiculture – productive use of wet peatlands*. Schweizerbart Science Publishers, Stuttgart, p. 143-149.
- DEFRA (Department for Environment Food & Rural Affairs) (2013) Payments for Ecosystem Services: A Best Practice Guide: Annex - Case studies, 38 pp.
- FAO (Food and Agriculture Organisation of the United Nations) (2016) Peatlands and Climate change. Infographic, online available: <http://www.fao.org/3/a-c0068e.pdf>.
- Freese, J. & Keelan, S. (2017) ELER in Deutschland. Übersicht über die Nationale Rahmenregelung und die Programme der Länder. Maßnahmensteckbrief 2014-2020, Agrarumweltmaßnahmen, Tierschutzmaßnahmen, Ökolandbauförderung, mit Hinweisen auf weitere ELER- und Länderförderungen im Naturschutz und Programme anderer EU-Mitgliedsstaaten. Letzte Korrektur und Ergänzung: April 2017. Bundesanstalt für Landwirtschaft und Ernährung, Deutsche Vernetzungsstelle Ländliche Räume (DVS), 119 p. https://www.netzwerk-laendlicher-raum.de/fileadmin/sites/ELER/Dateien/01_Hintergrund/ELER/013_Ma%C3%9FnahmensteckbriefAUM_2015_fertig008klein.pdf
- Grüne Liga (2007) Finanzierung: Wasserentnahmeentgelt. Steckbriefe zur wirksamen WRRL-Umsetzung. http://www.wrrl-info.de/docs/tafel_neu7_web.pdf
- Grüne Liga (2011) Economic Instruments in the Water Framework Directive: An Opportunity for Water Protection. Shortcomings in the First Management Cycle and the Need for Action. Policy Paper from GRÜNE LIGA e.V. on the German River Basin Management Plans. Berlin, 32 p. http://www.wrrl-info.de/docs/brosch_en_web.pdf
- Hansson, A., Pedersen, E. & Weisner, S.E.B. (2012) Landowners’ incentives for constructing wetlands in an agricultural area in south Sweden. *Journal of Environmental Management*, 113: 271-278.
- Hjerpe, K., Eriksson, H., Kanth, M., Boström, B., Berglund, K., Berglund, Ö., Lundblad, M., Kasimir, Å., Klemedtsson, L., Eksvärd, J., Lindgren, A. & Svensson, E. (2014) Utsläpp av växthusgaser från torvmark. Jordbruksverket, Rapport 24, 68 p.
- Jobda, M. (2008) Die neuen Agri-Umweltprogramme für Niedermoore in Polen. (The new agri-environment programmes for fens in Poland). Presentaion, 11.11.2008, Berlin.
- Joosten, H., Brust, K., Couwenberg, J., Gerner, A., Holsten, B., Permien, T., Schäfer, A., Tanneberger, F., Trepel, M. & Wahren, A. (2015) *MoorFutures® Integration of additional ecosystem services (including biodiversity) into carbon credits – standard, methodology and transferability to other regions*. BfN Skripten 407, Federal Agency for Nature Conservation, Bonn, 119 p.
- Keenleyside, C. & Moxey, A. (2011) Review of public funding of peatland management and restoration in the UK – a review. Report to IUCN UK Peatland Programme, Edinburgh. 20 p.
- Kölsch, L., Witzel, S., Czybulka, D. & Fock, T. (2016) Agricultural policy. In: Wichtmann, W., Schröder, C. & Joosten, H. (eds.) (2016) *Paludiculture – productive use of wet peatlands*. Schweizerbart Science Publishers, Stuttgart, p. 149-152.

- Leonardi, A., Bennett, G., Ruef, F., Abildtrup, J., Amato, G., Barquín, J., Benoît, M., Bodner, T., Fiquepron, J., Garcia, S., Montagné-Huck, C.-H., O'Driscoll, C.D. & Pérez-Silos, I.-S. (2017) State of European Markets 2017. Watershed Investments. Ecosystem Marketplace, Etifor, University of Padova, 43 p.
- LM M-V (2017) Umsetzung von Paludikultur auf landwirtschaftlich genutzten Flächen in Mecklenburg-Vorpommern. Fachstrategie zur Umsetzung der nutzungsbezogenen Vorschläge des Moorschutzkonzeptes. Ministerium für Landwirtschaft und Umwelt Mecklenburg-Vorpommern, Schwerin. 100 p.
- LU M-V (2015) Förderfibel zur Umsetzung des Entwicklungsprogramms für den ländlichen Raum Mecklenburg-Vorpommern 2014-2020. Ministerium für Landwirtschaft, Umwelt und Verbraucherschutz Mecklenburg-Vorpommern, Schwerin. 60 p.
- Matzdorf, B., Biedermann, C., Meyer, C., Nicolaus, K., Sattler, C. & Schomers, S. (2014) Was kostet die Welt?: Payments for ecosystem services in der Praxis. Erfolgreiche PES-Beispiele aus Deutschland, Großbritannien und den USA. oekom, München, 208 pp.
- Mikkelsen, S., Iversen, T.M., Kjær, S. & Feenstra, P. (2005) The regulation of nutrient losses in Denmark to control aquatic pollution from agriculture. In: *Evaluating Agri-environmental policies: design, practice and results*. p. 295-308. OECD publishing. <http://dx.doi.org/10.1787/9789264010116-23-en>
- Miljø- og Fødevarerministeriet (2017) Bekendtgørelse om kriterier for vådområdeprojekter og naturprojekter på kulstofrige lavbundsjord [Executive Order on Criteria for Wetland Projects and Nature Projects on carbon-rich lowlands]. BEK nr 1439 af 06/12/2017.
- ML Niedersachsen (2017) PFEIL 2014 – 2020, Programm zur Förderung der Entwicklung im ländlichen Raum in Niedersachsen und Bremen, Förderwegweiser. Niedersächsisches Ministerium für Ernährung, Landwirtschaft und Verbraucherschutz, Hannover. 60 p.
- MWT (Montgomeryshire Wildlife Trus) (n.d.) Invest in the Pumlumon Project. Carbon store. Water tank. Wildlife haven. Brochure for green investors, 28 p. http://www.iucn-uk-peatlandprogramme.org/sites/www.iucn-uk-peatlandprogramme.org/files/Pum_brochure.pdf
- Nordic Council of Ministers (2009) Case study: Agri-environmental schemes applied in Denmark. In: *Payment for and Management of Ecosystem Services: Issues and Options in the Nordic Context*. p. 75–86. Nordic Council of Ministers, Copenhagen, 124 p.
- Peters, J. & Unger, M. von (2017) Peatlands in the EU Regulatory Environment. Survey with case studies on Poland and Estonia. BfN-Skripten 454, German Federal Agency for Nature Conservation, Bonn. DOI 10.19217/skr454
- Reed, M.S., Allen, K., Attlee, A., Dougill, A.J., Evans, K.L., Kenter, J.O., Hoy, J., McNab, D., Stead, S.M., Twyman, C., Scott, A.S., Smyth, M.A., Stringer, L.C. & Whittingham, M.J. (2017) A place-based approach to payments for ecosystem services. *Global Environmental Change* 43, 92–106.
- Reed, M.S., Buckmaster, S., Moxey, A., Keenleyside, C., Fazey, I., Scott, A., Thomson, K., Thorp, S., Anderson, R., Bateman, I., Bryce, R., Christie, M., Glass, J., Hubacek, K., Claire, Q., Maffey, G., Midgely, A., Robinson, G., Stringer, L., Lowe, P. & Slee, B. (2010) Policy options for sustainable management of UK peatlands. Review commissioned by the IUCN UK Peatland Programme's Commission of Inquiry on Peatlands. 41 p.
- Reed, M.S., Moxey, A., Prager, K., Hanley, N., Skates, J., Bonn, A., Evans, C.D., Glenk, K. & Thomson, K. (2014) Improving the link between payments and the provision of ecosystem services in agri-environment schemes. *Ecosystem Services* 9, 44–53.
- Röder, N., Henseler, M., Liebersbach, H., Kreins, P. & Osterburg, B. (2015) Evaluation of land use based greenhouse gas abatement measures in Germany. *Ecological Economics*, 117: 193-202.
- Rose, H. (2011) An introduction to Glastir and other UK agri-environment schemes. National Assembly of Wales, Paper number 11/012.
- SEGES (2017) Virkemiddelkatalog, målrettede miljøtiltag i landbruget. SEGES Landbrug & Fødevarer F.m.b.A, Aarhus. 44 p.
- Smith P., M. Bustamante, H. Ahammad, H. Clark, H. Dong, E. A. Elsidig, H. Haberl, R. Harper, J. House, M. Jafari, O. Masera, C. Mbow, N. H. Ravindranath, C. W. Rice, C. Robledo Abad, A. Romanovskaya, F. Sperling & Tubiello, F. (2014) Agriculture, Forestry and Other Land Use (AFOLU). In: *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- Svensson, E. (2014) The Tullstorp Stream Project – success factors, challenges and recommendations for improvement of agri-environment project. Report within the Baltic Compact project. 39 p.
- UN (United Nations) (2015) Paris Agreement. http://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf (04.01.2018).

Wichtmann, W., Schröder, C. & Joosten, H. (eds.) (2016). Paludiculture – productive use of wet peatlands. Climate protection - biodiversity - regional economic benefits. Schweizerbart Science Publishers, Stuttgart, 272 p.

Wollenberg, E., Richards, M., Smith, P., Havlík, P., Obersteiner, M., Tubiello, F.N., Herold, M., Gerber, P., Carter, S., Reisinger, A., van Vuuren, D.P., Dickie, A., Neufeldt, H., Sander, B.O., Wassmann, R., Sommer, R., Amonette, J.E., Falcucci, A., Herrero, M., Opió, C., Roman-Cuesta, R.M., Stehfest, E., Westhoek, H., Ortiz-Monasterio, I., Sapkota, T., Rufino, M.C., Thornton, P.K., Verchot, L., West, P.C., Soussana, J.-F., Baedeker, T., Sadler, M., Vermeulen, S. & Campbell, B.M. (2016) Reducing emissions from agriculture to meet the 2 °C target. *Global change biology* 22 (12), 3859–3864.

Žmihorski, M., Kotowska, D., Berg, Å. & Pärt, T. (2016) Evaluating conservation tools in Polish grasslands: The occurrence of birds in relation to agri-environment schemes and Natura 2000 areas. *Biological Conservation* 194, 150–157.

Žmihorski, M., Krupiński, D., Kotowska, D., Knap, J., Pärt, T., Obłóza, P. & Berg, Å., (2018) Habitat characteristics associated with occupancy of declining waders in Polish wet grasslands. *Agriculture, Ecosystems & Environment* 251, 236–243.

European Union legislation

CAP Pillar 1

Regulation (EU) No 1307/2013 of the European Parliament and of the Council of 17 December 2013 establishing rules for direct payments to farmers under support schemes within the framework of the common agricultural policy and repealing Council Regulation (EC) No 637/2008 and Council Regulation (EC) No 73/2009

CAP Pillar 2

Regulation (EU) No 1305/2013 of the European Parliament and of the Council of 17 December 2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) and repealing Council Regulation (EC) No 1698/2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD)

Birds Directive

Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds
Habitats Directive

Habitats Directive

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora

Water Framework Directive

Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy

Photo on the back cover: Engage farmers, locals and tourists for wet peatlands: ensure accessibility, provide options to learn and experience, incorporate perceptions and personal interests in planning processes, facilitate cooperation.

