Food and Agriculture Organization of the United Nations

Sphagnum farming for replacing peat in horticultural substrates

Rastede, Lower Saxony, Germany (53° 15.80′ N, 08° 16′ E)

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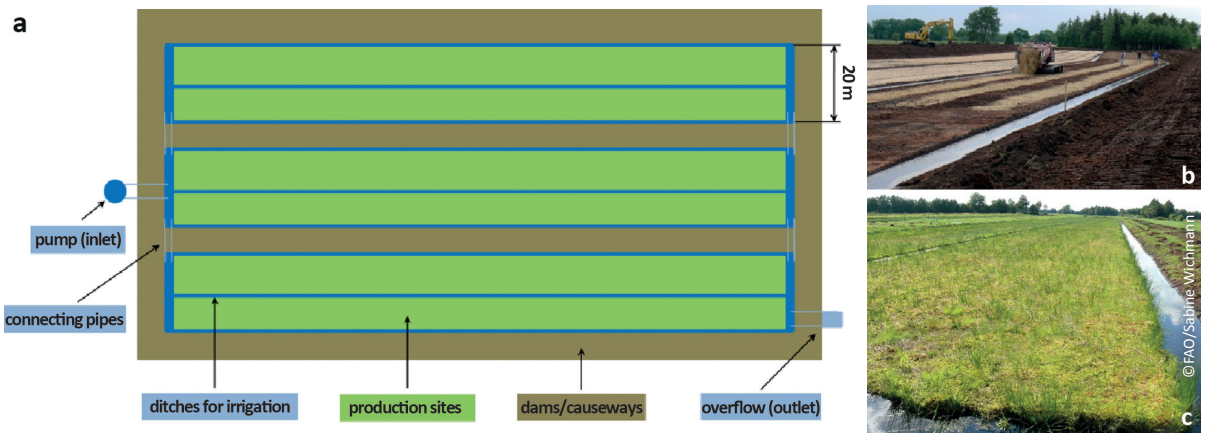

Sphagnum farming: a: site with infrastructure for water management (pump, ditches, overflow) and dams used as causeways (maintenance, harvest, transport) (schematic representation: Sabine Wichmann) b: Preparation of a *Sphagnum* farming production site (photo: Sabine Wichmann); c: same site with established Sphagnum culture and irrigation system (photo: Sabine Wichmann).

Summary

Sphagnum (peat moss) biomass provides a GHG-neutral alternative to fossil peat in professional horticulture. So far however, it has only been collected in the wild. Small-scale land-based *Sphagnum* farming is currently practiced on degraded peatlands. *Sphagnum* farming has also been tested on specially constructed floating mats that guarantee a constant water supply. This water–based cultivation allows bog waters to be used as reservoirs to irrigate cultivated areas in dry periods. It also creates additional *Sphagnum* farming areas. A mosaic of rewetted areas with land-and water-based cultivation may present the optimal combination for *Sphagnum* farming on degraded bogs. Experiments have also shown the suitability of growing media made of *Sphagnum* biomass for cultivating a wide variety of crops from seedling to saleable plant. *Sphagnum* biomass is also suitable for other uses, including gardening design, terrariums, sanitary items, insulation of buildings, water filtering and pharmaceuticals.

When *Sphagnum* is cultivated as a new agricultural crop on rewetted peatlands, the high and stable water levels greatly reduce GHG emissions and the subsidence of the formerly drained peat soil. *Sphagnum* farming combines long-term land productivity with climate change mitigation and sustainable employment in rural areas. It also provides habitats for rare bog species and preserves the land's paleo-environmental archives.

This case study descibes a succesful small-scale test of a four-hectare, commercial *Sphagnum* farming pilot site established in the spring of 2011. The heavily degraded topsoil of a drained agricultural bog grassland was removed, a water management system installed and *Sphagnum* mosses were spread with a manure spreader mounted on a modified snow groomer. After a year and half, *Sphagnum palustre, S. papillosum and S. fallax* covered 95 percent of the area with an average lawn height of 8.3 cm (maximum 22.4 cm). These results demonstrate the feasibility of large-scale *Sphagnum* farming. Methods and machinery are now being developed to scale up cultivation.

1. Practice description

Area of the site	4 ha	
Current land cover/use	Wetland/*Sphagnum* farming (paludiculture)	
Previous land cover/use	Drained bog grassland used as pasture and meadow	
Origin of intervention	Applied research project; cooperation of universities and peat companies	
Types of intervention used in the area	☑ Rewetting ☐ Drainage ☑ Cultivation of crops ☐ Grazing ☐ Forestry ☐ Aquaculture ☐ Fishery	
Duration of implementation	Three years	
Main purpose of the practice	Production of a renewable, high–quality raw material for horticultural growing media; sustainable agriculture on wet peatland	
Level of technical knowledge	☐ Low ☑ Medium ☐ High	
Water table depth from surface	From 0 to 0.1 m	
Present active drainage system[13]	Width of channels	0.5 m
	Distance between channels	10 m
Subsidence	Before practice	2 cm year^{-1}
	During practice	0 cm year^{-1}

2. Implementation of activities, inputs and cost

N	Establishment of activities	Input /materials	Duration	Cost
1	Preparing production site	Excavator; removing degraded top soil, levelling of surface, infrastructure for water management.	Two months	High
2	Establishing moss lawn	Manure spreader mounted on an adapted snowgroomer. *Sphagnum* fragments, straw mulch.	One week	Medium
3	Rising and regulating water table	Elaborated water management using pumps, pipes, ditches for irrigation and outflows for water surplus.	Permanent	Medium

Remarks:

High costs partly caused by the need to adopt an applied research project approach could be reduced for production systems.
Crucial point: availability of *Sphagnum* fragments and water table management.

[13] The channel system is established for irrigation which is ensured by constantly high water table (depth from surface 0 to 10 cm).

3. Environmental characteristics

Climate	☐ Tropical ☑ Temperate ☐ Boreal	
Average annual rainfall	750 mm	
Altitude	0.5 m a.s.l.	
Slope	0 percent	
Peat depth (cm)	☐ ≤ 30 ☐ 30–50 ☐ 50–100 ☑ 100–300 ☐ >300	
Peatland type based on the water source	☐ Fen ☑ Bog ☐ Undefined	
Hydrologic network	Drainage water of the surrounding grassland is pumped to the North Sea (polder situation below sea level).	
Main vegetation species	Before practice	*Alopecurus pratensis, Poa pratensis, Trifolium repens, Holcus lanatus, Ranunculus repens*
	During practice	*Sphagnum palustre, Sph. papillosum, Sph. fallax, Juncus effusus, Drosera rotundifolia*
Water quality	Water pH	5.5
	Water turbidity	–
	Dissolved organic carbon content	20 – 130 mg L^{-1}

4. Socio-economic dimension

Local stakeholders	Farmers, peat and growing media industry, environmentalists
Land tenure	Private
Land, water, and other natural resource access and use rights	Land is privately owned and has to be bought or rented; district authority has to authorize major changes in land use and how water from drainage channels is used
Conflicts	Limited peatland resources and multiple interests, including grassland for dairy cattle, peat extraction, maize cultivation and high nature value grassland (breeding waters)
Conflict resolution mechanism	Identification of priority areas for different land use types by landscape planning
Legal framework	Drainage–based grassland use is favoured by subsidies (EU Common Agricultural Policy); permission and compensation will be needed when transferring grassland into *Sphagnum* farming site
Products derived from the peatland	*Sphagnum* biomass as raw material for growing media in horticulture
Market orientation	Growing media producers and growers aiming at regional, renewable and peat reduced high–quality substrates for professional horticulture

5. Assessment of impacts on ecosystem services

1 highly decreasing/ 2 moderately decreasing/ 3 slightly decreasing/ 4 neutral/ 5 slightly increasing/ 6 moderately increasing/ 7 highly increasing

Provisioning services	Agricultural production	4
	Food security and nutrition	2
	Employment	3
	Income	–
	Non-timber forest products yield	4
	Livelihoods opportunities	–
	Resilience and capacity to adapt to climate change	7
	Long-term usability of peatland site	7
Socio-cultural services	Level of conflicts	2
	Gender equality	4
	Learning and innovation	7
	Preserving landscape archive in peat	7
Regulating services	Waterborne carbon (DOC) loss	2
	Fire frequency	3
	Biodiversity	7
	Subsidence rate	1
	Water retention	7
Off-site benefits	Water quality	6
	Frequency of flooding	4
	Local cooling effect, water evaporation	6

6. Climate change mitigation potential

1 highly decreasing/ 2 moderately decreasing/ 3 slightly decreasing/ 4 neutral/ 5 slightly increasing/ 6 moderately increasing/ 7 highly increasing

Impact	Rate	Estimate ($t\ ha^{-1}\ year^{-1}$, CO_2-eq)	Remarks
Net GHG emission	1	5	50 percent wet production site, 5 percent ditches, 45 percent dams
CH_4 emission	6	<1	mainly from ditches
CO_2 emission	1	4	mainly from dams
N_2O emission	1	0	–
Carbon sequestration/ storage abovegrounds	4	0	Carbon accumulation in biomass is excluded from the balance due to regular harvest

7. Additional information

Sphagnum farming in Germany has extensively been studied during the last decade in various research projects with promising results see www.sphagnumfarming.com for further details.

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