Paludiculture

Naturally Somerset
Somerset Local Nature partnership

What is it?

- Describes farming and agroforestry systems designed to generate a commercial crop from wetland conditions using species that are tolerant of wetlands
- Does not seek to displace conventional agriculture
- Not directly concerned with biodiversity, habitat loss or nature conservation

Species include?

- Global Database of Potential Paludiculture Plants (DPPP)
- Common Reed (Phragmites australis), Sweet Grass (Glyceria fluitans), Sphagnum, conifers (Picea abies, Pinus), Alder (Alnus glutinosa), Ash (Fraxinus excelsior), Birch (Betula pubescens), Poplar (Populus) Willow (Salix), Reed Canary Grass (Glyceria fluitans), Redtop (Agrostis gigantea), Reed Manna Grass (Glyceria maxima), Marsh Foxtail (Alopecurus geniculatus) and Lesser Pond Sedge (Carex acutiformis), Miscanthus Grass (Miscanthus giganteus)

Uses?

- Bioenergy Crops (24 spp.)
- Solar Power
- Food Production
- Antibacterial
- Food Preservation
- Medicine
- Construction materials
- Fabric

Paludiculture trials?

Sphagnum Farming - Germany

- 100% cover, 5-9 cm thick in 1.5 yrs
- Site 1 - water table maintained at -10 cm, gaps filled at the end of yr 1
- Site 2 - variable water table and no gap-filling, 90% cover in 3.5 yrs
- Productivity 3.7 – 6.9 tDM/ha/yr
- After 9 yrs total dry biomass accumulation = 19.5 t/ha
- Harvest once every 3–5 yrs

Sphagnum Farming - UK

- 2 sites - former agricultural site, organo-mineral soil and former extraction site, deep peat
- Micropropagated ‘founder’ material, not wild harvest = free from weeds
- Irrigation from above for reasonably saturated, not inundated condition
- ‘Mulches’ over sphagnum maintains high humidity
- UK sites ≥ observed growth rates in German tests

Economic considerations for Sphagnum Farming?

- Production costs ~ £50 m^3 + start-up costs
- Immediate market - range 50,000-24 100,000 m^3/yr, substituting wild harvest
- High market prices suppling reptile + floristry, £500 + £200-£250 m^3, respectively
- Peat demand in the UK growing media industry = 2.5 mil. M^3
  - Cultivation for growing media marketed at £25-50 m^3
- Global average dry biomass production: 260 g/m^2/yr,
  - UK expected production capacity: 500 g/m^2/yr, implying £833-1,667 ha/yr

Ecosystem Services?

- Flood storage potential
- Reduced GHG emissions
- Restore carbon and nitrogen retention
- Habitats for rare + threatened species
- Combine traditional + modern land uses
- Biomass with a versatile range of uses

Maximise Biodiversity?

- Maintain high soil-water levels - encourages biodiversity
- Rotational mosaic harvesting - species can migrate
- Harvest season – varies impact
- Expand crop type and product range for species arising spontaneously

Carbon dioxide and Methane?

- Studies not sufficient for robust emission factor estimates
- Crops requiring continuous inundation are unlikely to provide climate mitigation benefit due to high CH4 emissions (implications for Phragmites and Typha)
- Typha latifolia mitigates CH4 emissions vs. unvegetated control
- Harvesting effectively removed N + P, providing water purification co-benefit

Water?

- Subsidence - gravity drainage to pumped drainage = financial and energy costs
- Increased winter storage reducing the volume for pumping
- More water lost via evapotranspiration reducing volume for pumped drainage
- Reduced irrigation needs, but remains vital where land subsidence has occurred

Barriers to transition?

- Water Management - IDBs and pumped drainage, evapotranspiration rates
- Weed Control - underdeveloped methods, herbicides’ linkages to watercourses
- Mechanisation and Scale - increased production incentivises machinery, infrastructure and markets visa versa
- Trafficability - bearing capacity and shear strength, soils are unlikely to support conventional machinery

Incentives for transition?

- Net zero carbon strategy
- UN FAO actively promoting paludiculture for climate-responsible peatland management – especially relevant for climate adaptation in the Somerset Levels
- Voluntary carbon markets + land investment vehicles
- Carbon credits are traded commodities, and experience price volatility + can be quality assured via the Peatland Code

DEFRA, Literature Review: Defra Project SP1218 An assessment of the potential for paludiculture in England and Wales, 2020