

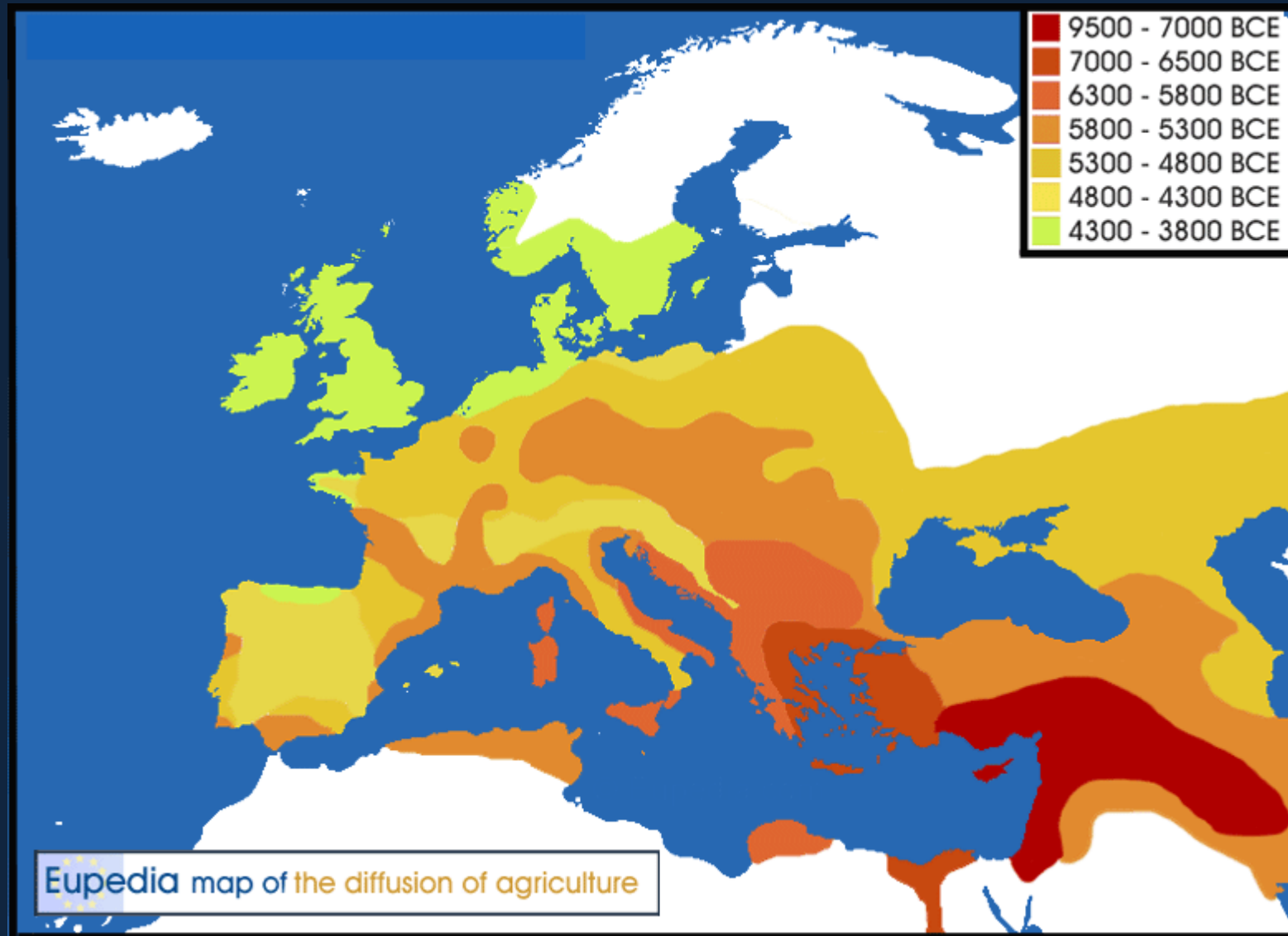
Wet farming ('paludiculture') – a possible future for farming on peat soils?

Richard Lindsay, Sustainability Research Institute



This is the birthplace of conventional farming – Anatolia in Turkey – a semi-desert environment from which the staples of conventional agriculture are derived: emmer wheat, barley, sheep – all semi-desert species suited to *dryland* conditions and unsuited to *wetland* conditions.





So as Neolithic agriculture spread westwards, it carried with it the idea that *drylands* are good, *wetlands* are bad. This concept has underpinned conventional agriculture for almost 6,000 years, and continues to drive wetland drainage today.

Areas of wetland on a farm are seen as evidence for bad farming, and huge sums are spent in efforts to convert such 'problem' areas into 'good productive farmland'.



A potato field on peat in Europe emits 37 T CO₂e /ha/yr, which is equivalent to the annual emissions from 10 family cars for *every hectare* of such agriculturally-worked soil.

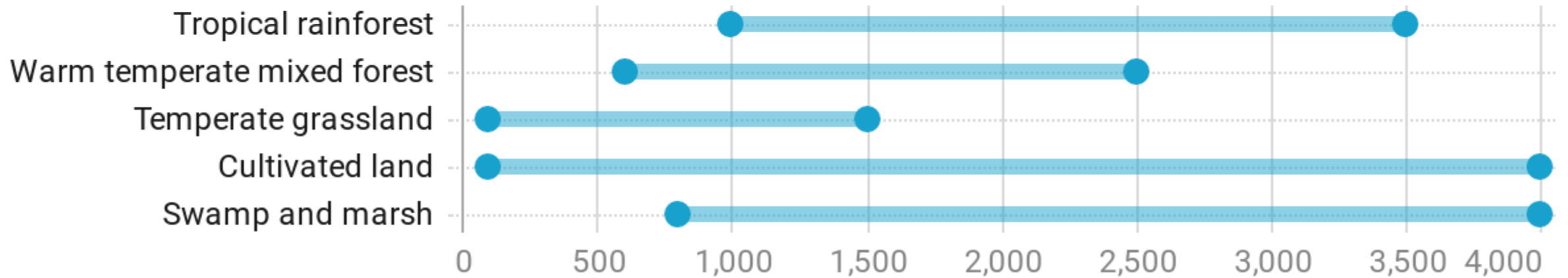


... so peat potatoes are fossil resources...

Ukraine

Yet wetlands are some of the most productive ecosystems on Earth...
...capable of matching or exceeding much cultivated land.

Net primary productivity of selected vegetation types

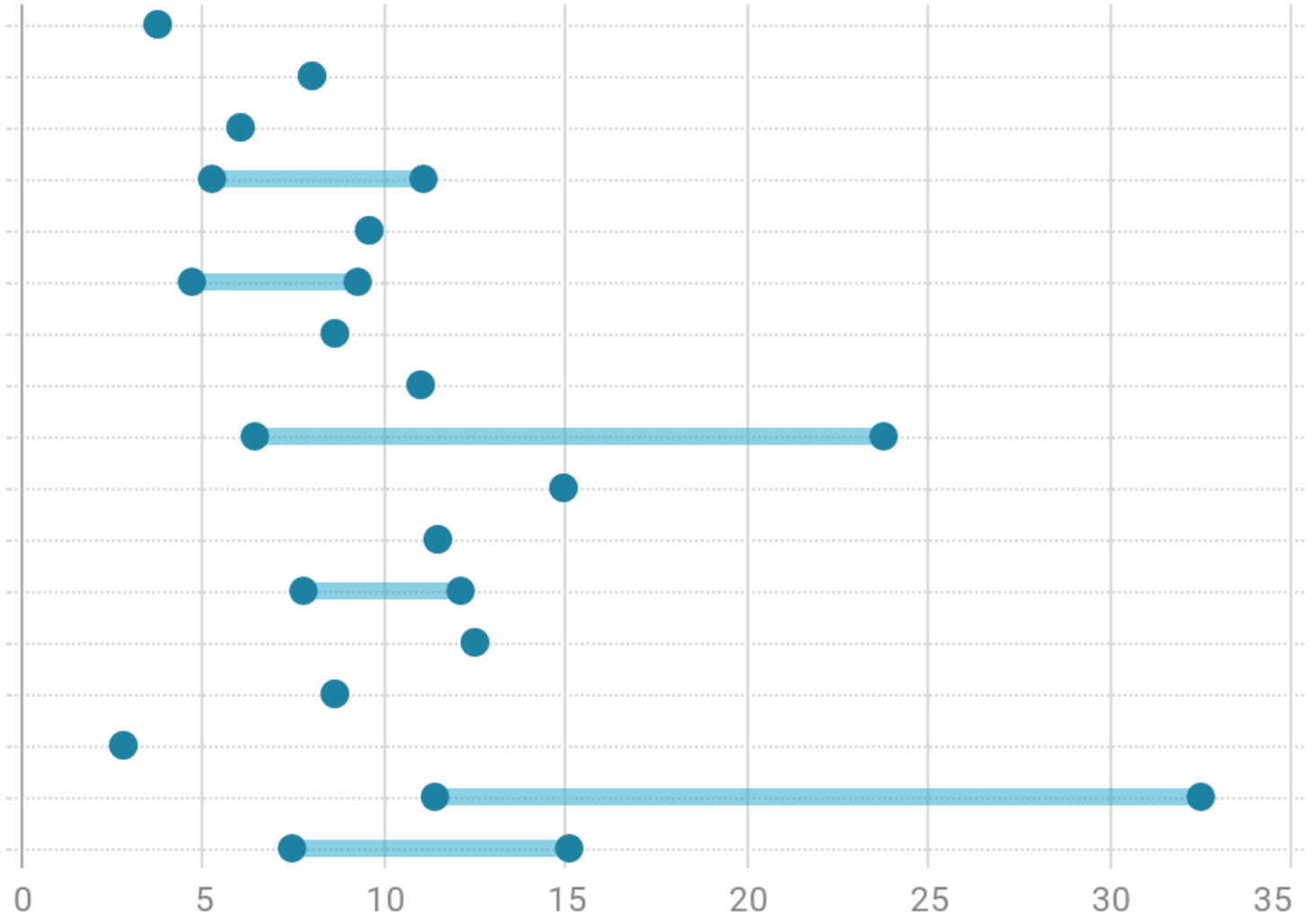


Net primary productivity ($\text{g m}^{-2} \text{ yr}^{-1}$)

Source: Williams, 1990a • Created with Datawrapper

Average yields for a range of wetland and agricultural crops (tonnes of dry matter per hectare per year)

- Carex acuta : summer harvest
- Carex acuta : July harvest
- Carex acutiformis : June-July harvest
- Carex riparia : May-September harvest
- Phalaris arundinacea : winter harvest
- Phalaris arundinacea : May-September harvest
- Phragmites australis : August harvest
- Phragmites australis : January-March harvest harvest
- Phragmites australis : May-September harvest
- Typha spp. : March-May harvest
- Typha angustifolia : May-October harvest
- Typha latifolia : May-September harvest
- Temporary grassland
- Permanent grassland
- Rough grazing
- Wheat - range for Canadian prairies
- Range for early, standard and late-sown wheat - Japan



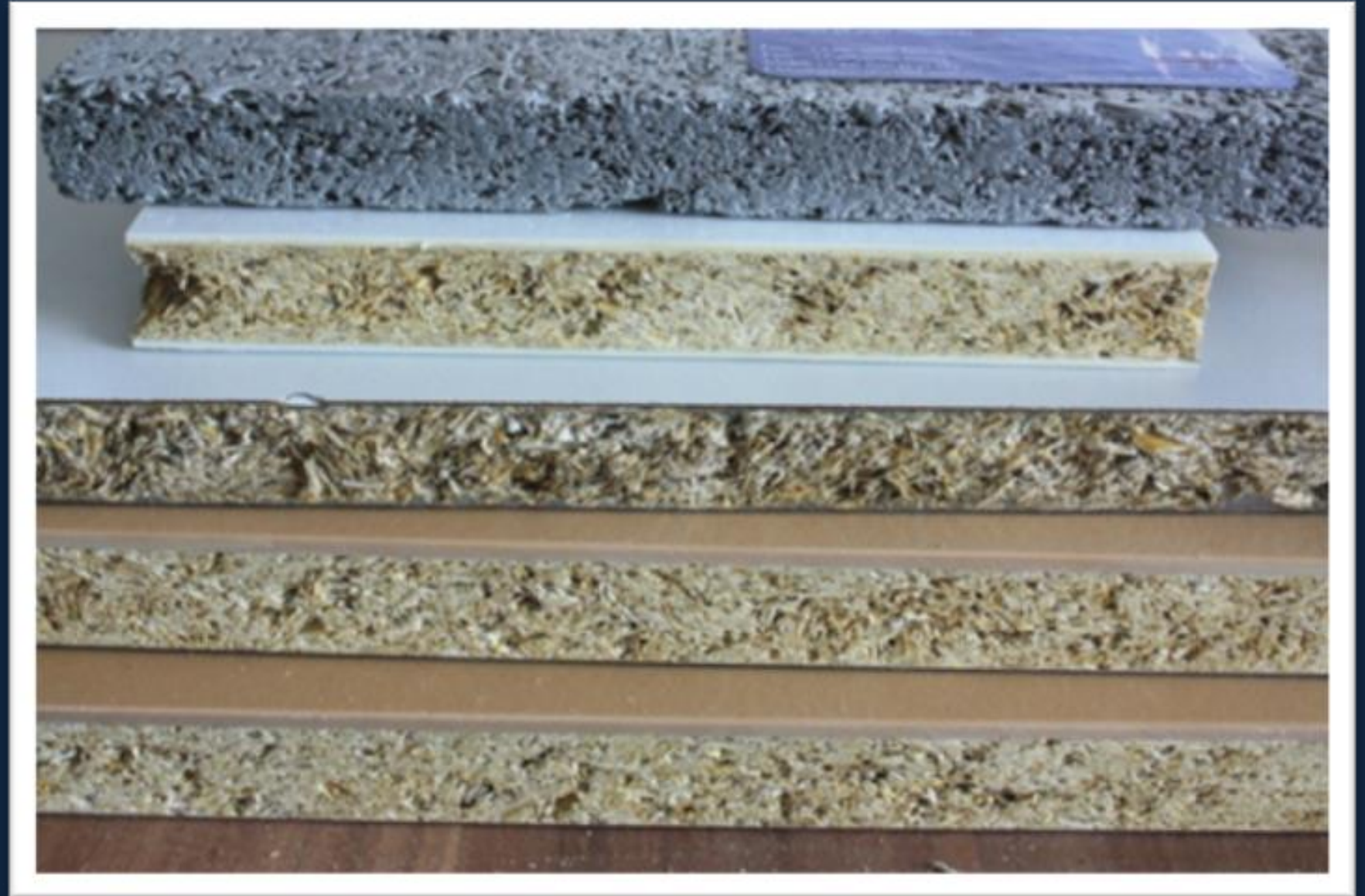
Common reed (*Phragmites australis*) has a history of use that even pre-dates conventional agriculture.

Its use in thatching continues to the present day but entirely new uses are being found for it.



It can be compressed into a fibre-board that is light, fire-proof, breathable and resistant to rot when waterlogged.

It can also be converted to pellets for use in biomass boilers.



Raw materials: China uses yearly 450,000 tonnes of reed for paper

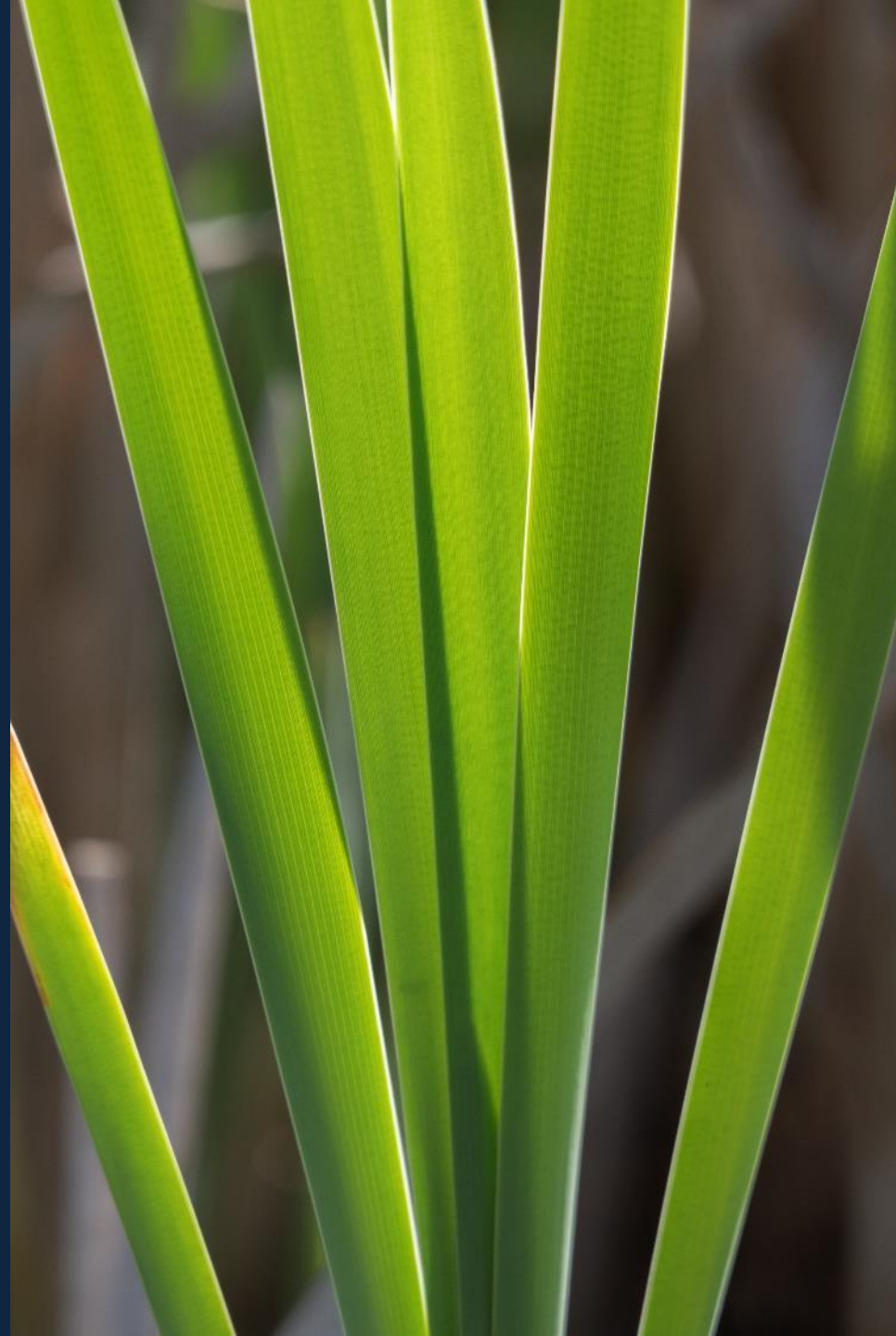


Jan Köbbing

Neimongol, China

Reedmace (*Typha latifolia*) – commonly, though incorrectly, called bulrush largely due to a painting that hangs in the Palace of Westminster depicting Moses in the ‘bulrushes’ and the artist confused his wetland plants...

It has a thick rhizome rich in carbohydrate, its cigar-shaped seed head can also be turned into food, while its stems and leaves can be pressed into building board of a quality and character that allows it to be used in restoration of listed buildings in Germany.



Typha grows vigorously where water is most polluted with nitrogen and phosphorus, so it is widely used in 'constructed wetlands' to clean polluted water. If the plants are then harvested a very high proportion of the trapped phosphorus can be retrieved from the ash if the plant is then burned.

Our next speaker will talk much more about its cultivation and use so I will not dwell further on the many benefits of this most productive of wetland plants.



Wetlands can also be used for agroforestry. While few of our Native trees can cope with salt incursion, the majority are able to tolerate or even thrive under waterlogging by freshwater flooding.

Willow and alder are both well adapted to wet ground. Willow is our fastest-growing deciduous tree, which results in a softwood timber, while alder produces dense wood that can be used for furniture or veneer.



In the UK we treat soft rush (*Juncus effusus*) as a problem – a sign of drainage problems and ‘poor ground’ ...but in Japan it is a resource – as it used to be here – providing a soft, breathable floor covering: *tatami* mats woven from soft rush are an icon of Japanese culture even today.





By halfrain - 四畳半, CC BY-SA 2.0, <https://commons.wikimedia.org/w/index.php?curid=76568624>



By Toby Oxborrow - <https://www.flickr.com/photos/oxborrow/82990625/>,
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Tatami matting

By halfrain - 座敷, CC BY-SA 2.0, <https://commons.wikimedia.org/w/index.php?curid=76699119>

Nettles are a wetland species characteristic of wet alder woods, so could be grown as a companion crop with alder.

The tough but flexible fibres of the stem were used to make fabrics long before cotton.

Indeed, the fibres produce a material that is superior to fabrics made from cotton.

The current limitation of this market lies in the shortage of raw material and the processing to release the fibres.





This is why nettle fabrics are currently restricted to the luxury market, in which they are award winners.

Global Change Award

AN INNOVATION CHALLENGE
BY H&M FOUNDATION



Berries from wetlands

Cranberries are now the basis of a global billion-dollar industry either as juice or as dried fruit. Although the industry uses the American cranberry, our own cranberry used to be wild-harvested and sold widely.

In Finland, berries collected from wetlands generate close to 14 million dollars each year. The crop includes many berries that grow naturally on our peatlands, including – as here – the crowberry (*Empetrum nigrum*), as well as the cloudberry, bilberry and bearberry.



The sundew is a carnivorous wetland plant that fascinated Charles Darwin – he wrote a whole book about it – but it has also been used in herbal medicine for hundreds, possibly thousands, of years.

It was used until quite recently to produce a health tonic called *rosa solis* which was widely thought to help rejuvenate and re-invigorate.

Today it is mostly used to treat chest infections, and somewhere between 6 tonnes and 20 tonnes of dried sundew is wild-harvested every year for this purpose, yet demand still far outstrips supply.



In SE Asia and other tropical regions, rice has given rise to entire civilizations. Under current climate regimes this wetland plant cannot be grown successfully in the UK, but We have our own version of rice – sweet manna grass (*Glyceria fluitans*) – that was wild-harvested until a century ago to produce a sweet flour.

Sweet manna grass fell out of favour because it was so labour-intensive to harvest from the wild, and cultivation was never Attempted.

As part of an Innovate UK project we have been testing the growth of *Glyceria* and are looking to develop a breeding programme aimed at increasing its potential as a wetland crop for cultivation.



MANNAGRÄS, GLYCERIA FLUITANS (L.) R. BR.

AGRI-Tech – Innovate UK Sphagnum farming project

- Funded by innovate UK, from 1st Jan 2018 to March 2019
- Our project Partners: Micropropagation Services, Manchester Metropolitan University, Natural England, Melcourt industries and our farming partners the Stanleys.



Why farm Sphagnum bog moss? The moss has a great many uses. It was wild-harvested during WW1 to produce the First Field Dressing, issued to all allied troops prior to the Battle of the Somme. The absorbent and anti-septic properties of *Sphagnum* saved thousands of lives by preventing gangrene – a major killer of injured troops up to that point. These same properties enabled Vikings to store fresh salmon for long voyages – so Sphagnum is also now of interest to the food industry. For more information see my blog about [the amazing Sphagnum bog moss](#).



British wounded Bernafay Wood 19 July 1916" by Ernest Brooks. This is photograph Q 800 from the collections of the Imperial War Museums (collection no. 1900-09). Licensed under Public Domain via Commons

https://commons.wikimedia.org/wiki/File:British_wounded_Bernafay_Wood_19_July_1916.jpg#/media/File:British_wounded_Bernafay_Wood_19_July_1916.jpg

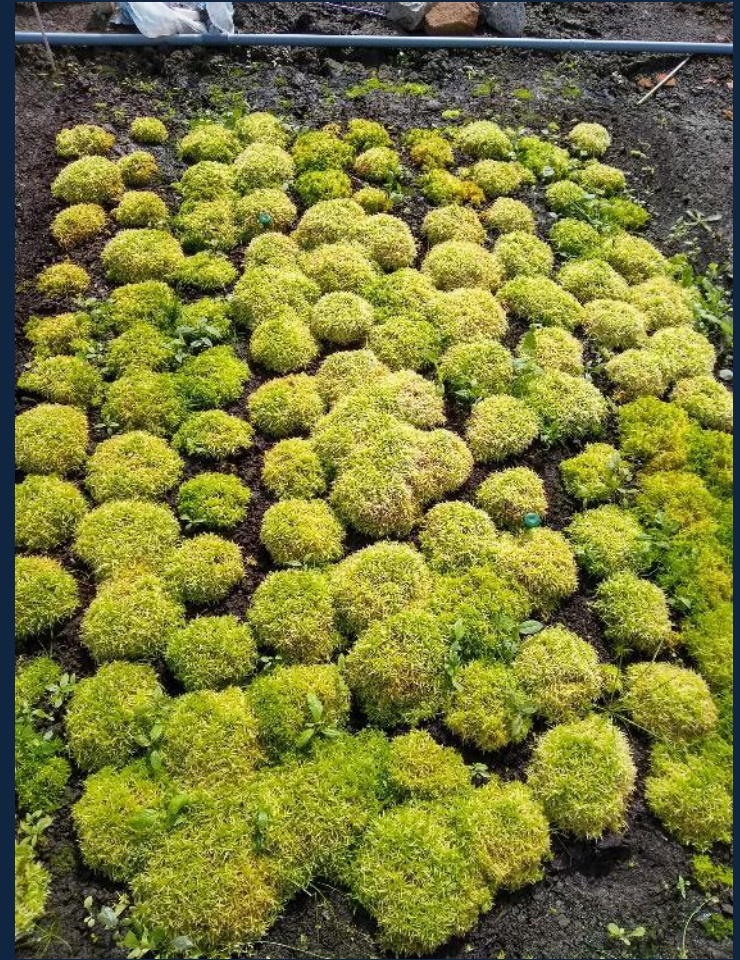
We are currently growing Sphagnum on two trial sites, one in a field in Leicestershire, the other to the west of Greater Manchester.

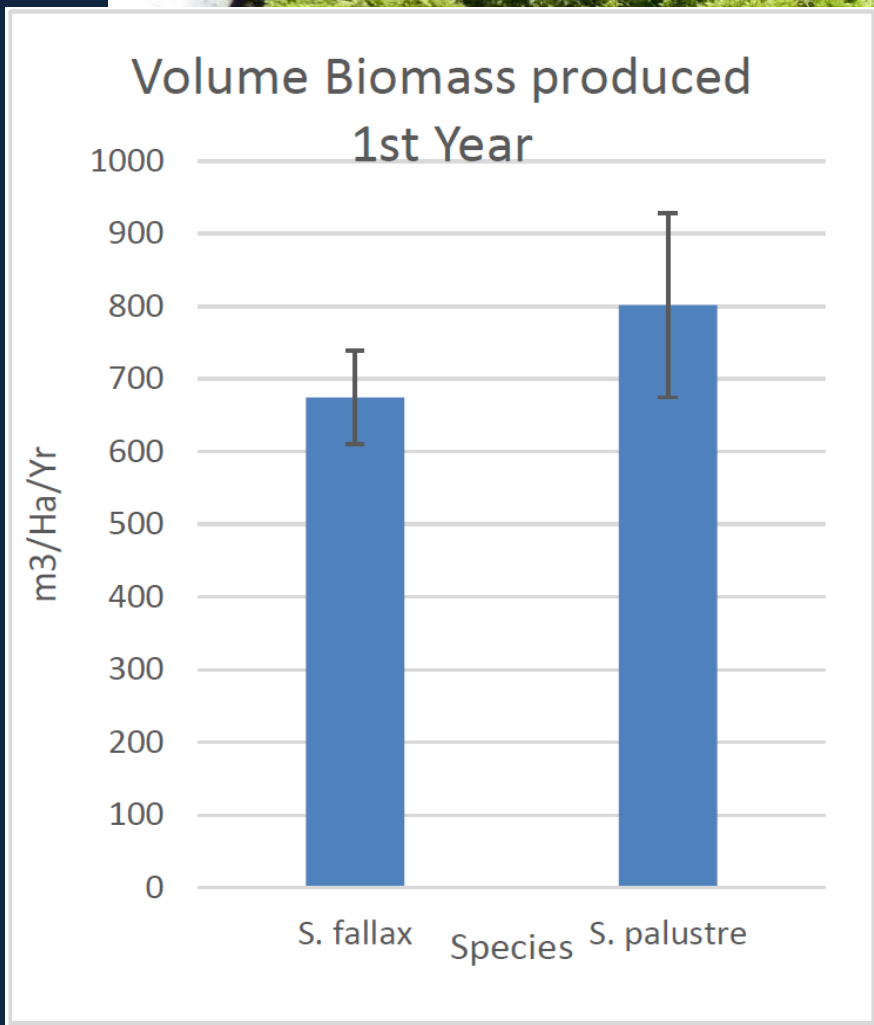


Leicestershire site



Greater Manchester site

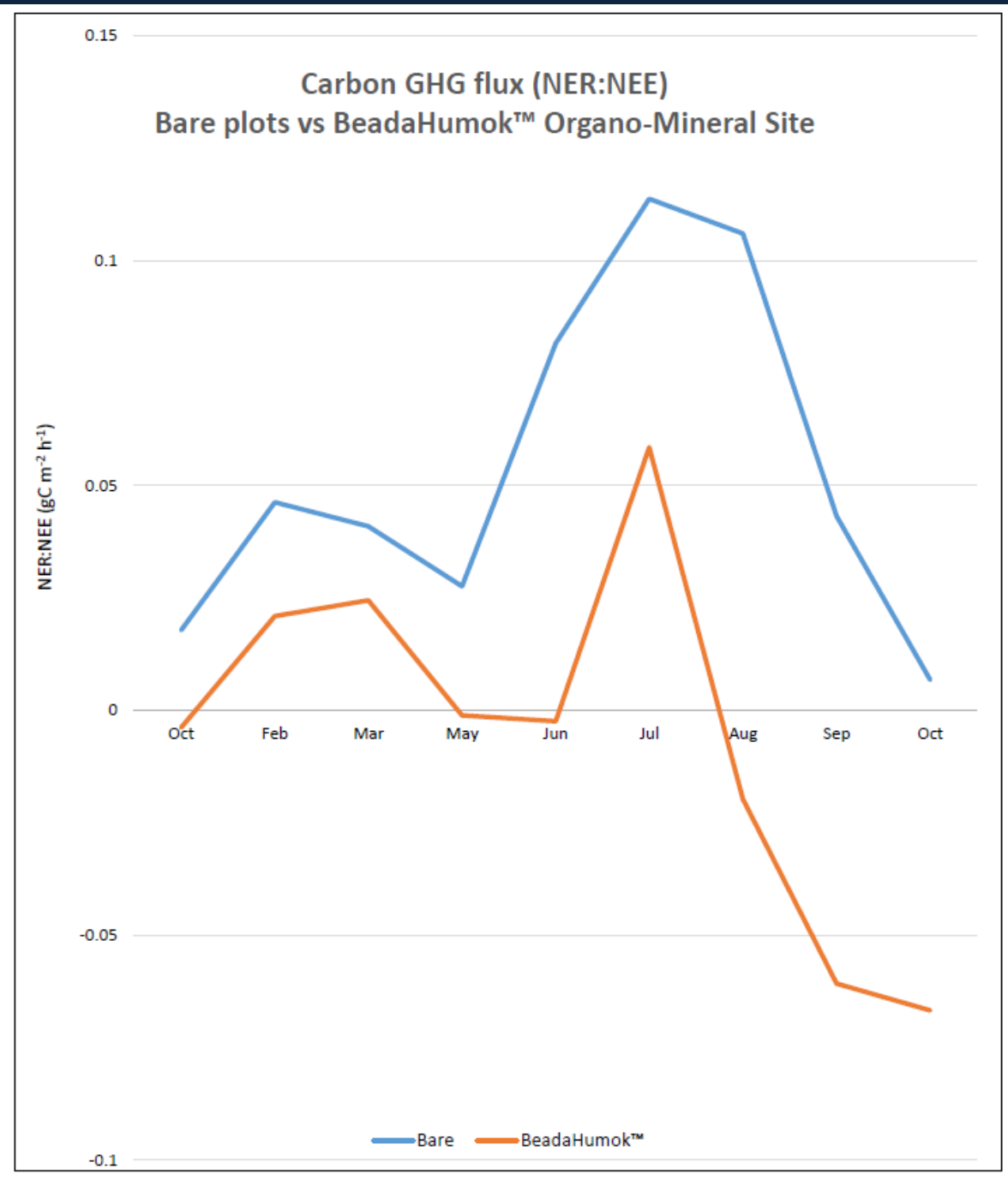




5 tonnes dry matter per hectare per year

We are using surface irrigation rather than raising water tables in the test Plots. This means that we can be good neighbours to adjacent conventional Farmland.

Crucially, although we have not raised water tables, we have still been able to halt carbon emissions, as can be seen by the orange line which becomes negative (meaning we are capturing carbon) once the Sphagnum developed a complete carpet in August.



Cabbage - Melcourt - 5 weeks after sowing

Control Peat

(Levington M2)

Sphagnum 20%

peat-free control

Our partners, Melcourt Industries, have been organising growing trials using cultivated Sphagnum with a view to replacing peat with farmed Sphagnum – indeed peat is simply ancient Sphagnum.



Peoples Postcode Lottery, Dream Fund – Waterworks project 2019 - 2021

Our project called Waterworks has been awarded **£1 million** by the **People's Postcode Lottery Dream Fund** beating over 200 competitors to be one of only three projects funded in the UK.

Project partners:



The future for this research area in the UK:



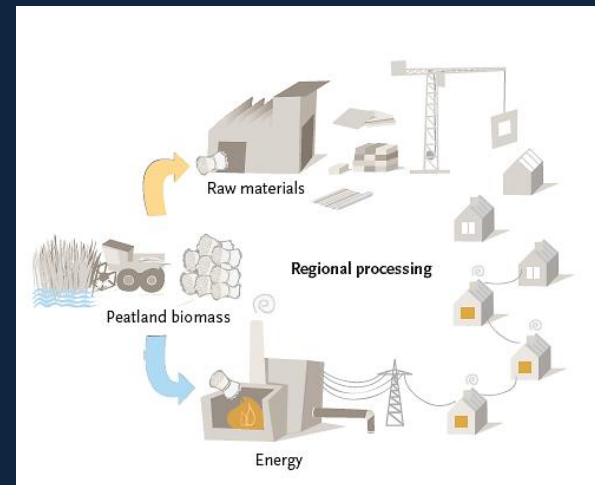
Identify suitable (preferably perennial) species, provenances and cultivars



Overcome technical challenges for harvesting on wet and inundated peatlands



Develop production lines adapted to new types of crop



Taken from: **Peatlands and climate change**, developed by the FAO team of the Mitigation of Climate Change in Agriculture (MICCA) Programme



There are exciting – but challenging - times ahead: