Extended abstract No. 164

DEVELOPMENT OF A TECHNOLOGY FOR HARVESTING PEAT MOSS ON FLOATING MATS

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SUMMARY

Within the joint project PROSUGA, members of seven institutions are developing a method of cultivating *Sphagnum* on water surfaces to gain a substrate for use in horticulture. Nearly 1,900 m² of floating mats were planted with peat moss. In its sub-project, the IASP is designing a harvester catamaran. Between the two hulls, the floating mats are pulled into a motorized mat feeder, lifting the mats for a clean cut. Finally the crops are removed and the mats are released at the water surface. The catamaran harvest has proven successful and is currently being optimized.

KEY WORDS: Harvest, harvester, moss, *Sphagnum*, catamaran

INTRODUCTION

In order to reduce industrial peat cutting, alternatives to peat-based horticulture substrates are required. Dried *Sphagnum* plants have qualities similar to those of peat. Mixed with other substances they are considered suitable for peat substitutes.

PROSUGA, an abbreviation for ‘industrial production of peat moss for the production of innovative culture substrates for horticulture’, is a joint project of three research institutions and four companies. Water bodies, especially those of open-cast mining, are used for cultivating *Sphagnum*. Such water bodies only have limited value as ecosystems or for recreation because of their content of acids and salt. To a wide extend *Sphagnum* is resistant to acids.

The objective of the IASP subproject is to develop an efficient application and harvest technology for *Sphagnum* cultivated on water surfaces. The first drainage and subsequent drying of the crops is also part of the task. Both the assessment of fundamentally different harvesting and mowing concepts as well as the higher demands in terms of corrosion-resistance had to be taken into account.

MATERIALS AND METHODS

In 2010 and 2011, up to 1,900 m² of floating mats were planted with peat moss and placed at an open-cast mining lake by the cooperation partner Humboldt-Universität zu Berlin in the federal state of Brandenburg. These should be harvested in autumn 2012. The crops need to be dried and processed into horticulture substrate. The pH values of 2 to 3 and high salt content place greater demands on corrosion resistance of all equipment.

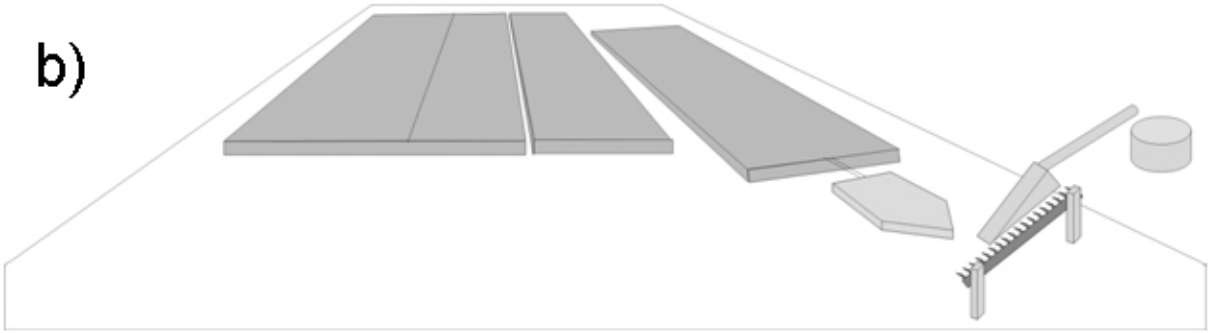
With respect to process technology, four different ways of harvesting are possible (Fig.1): the shore harvest, the shallow water harvest, the weed harvester, and the harvester catamaran. The first two variants require pulling of the floating mats to the site of harvest. Particularly for smaller water bodies like the experimental site, this would mean a labour intensive rotation of the cultivation mats. In contrast, both weed harvester and harvester catamaran float to the growing area allowing the mats to stay always at the same place. Harvesting by a conventional weed harvester requires good protection of the mats pushed under the hull and drive screw. Since this protection wasn't simple to implement, the development finally focussed on harvesting by a catamaran.

The re-establishment of growth conditions after the harvest could be carried out in different ways: 1. Cutting and processing of the upper parts of the moss plants only. The remaining lower parts start sprouting and growing again; 2. Complete removal of all plant matter and distribution of new planting material and a straw cover. The second option is much more time-consuming and expensive. Pre-experiments suggest equal growth after cutting as after removal and new crop establishment. Cutting is therefore preferred as a consequence of both arguments.

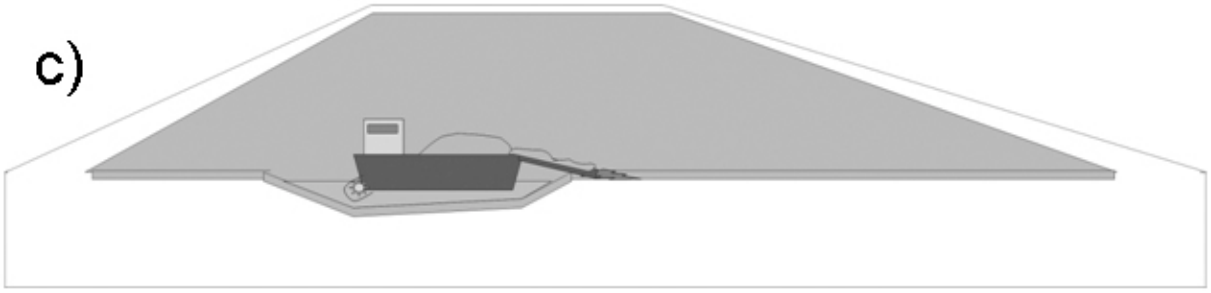
RESULTS

Weed harvesters available on the market were tested but have essentially proven unsuitable. Therefore, a new harvester catamaran was designed and constructed in 2011 (Fig.2). Currently, it is being optimized.

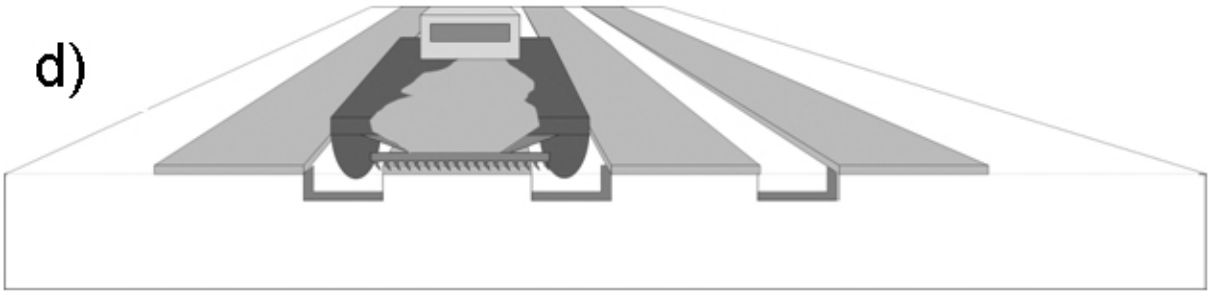
Floating mats are harvested on the shore and pulled thereafter back into the water.



The mats are pulled to a mowing bridge in shallow water.



A weed harvester is mowing the interconnected cultivation mats.



A harvester catamaran is mowing mats separately.

Fig.1 a) Shore harvest b) shallow water harvest c) weed harvester d) harvester catamaran

Fig.2. Harvester catamaran developed.

The harvester is made of several components:

1. The supporting structure with pontoons as floating bodies in the form of a catamaran. An outboard motor is located behind one of the two pontoon rows. This asymmetric design does not lead to tilt during forward motion. The supporting structure is made of aluminium profiles and the boat deck consists of reinforced synthetic gratings. The pontoons have proven sufficient buoyancy for high yields.
2. The patented floating mat feeder which is lifting the mats out of the water on a processing surface. This is not affected by the movements of the boat, the water, or the mowing unit (Fig.3). Two spike belts are used as in-feed conveyors while the processing area consists of several rotatable rollers.
3. The mowing unit, designed at first as a rotary mower, later as sickle bar and the crop removal device.
4. The moss feeder, which is needed for distributing new peat moss after whole-plant-removal harvest. To prevent clumping of the wet moss, comb bars are mounted on the dosing rollers.
5. Two hydraulic power units are providing oil for all components except the boat drive.

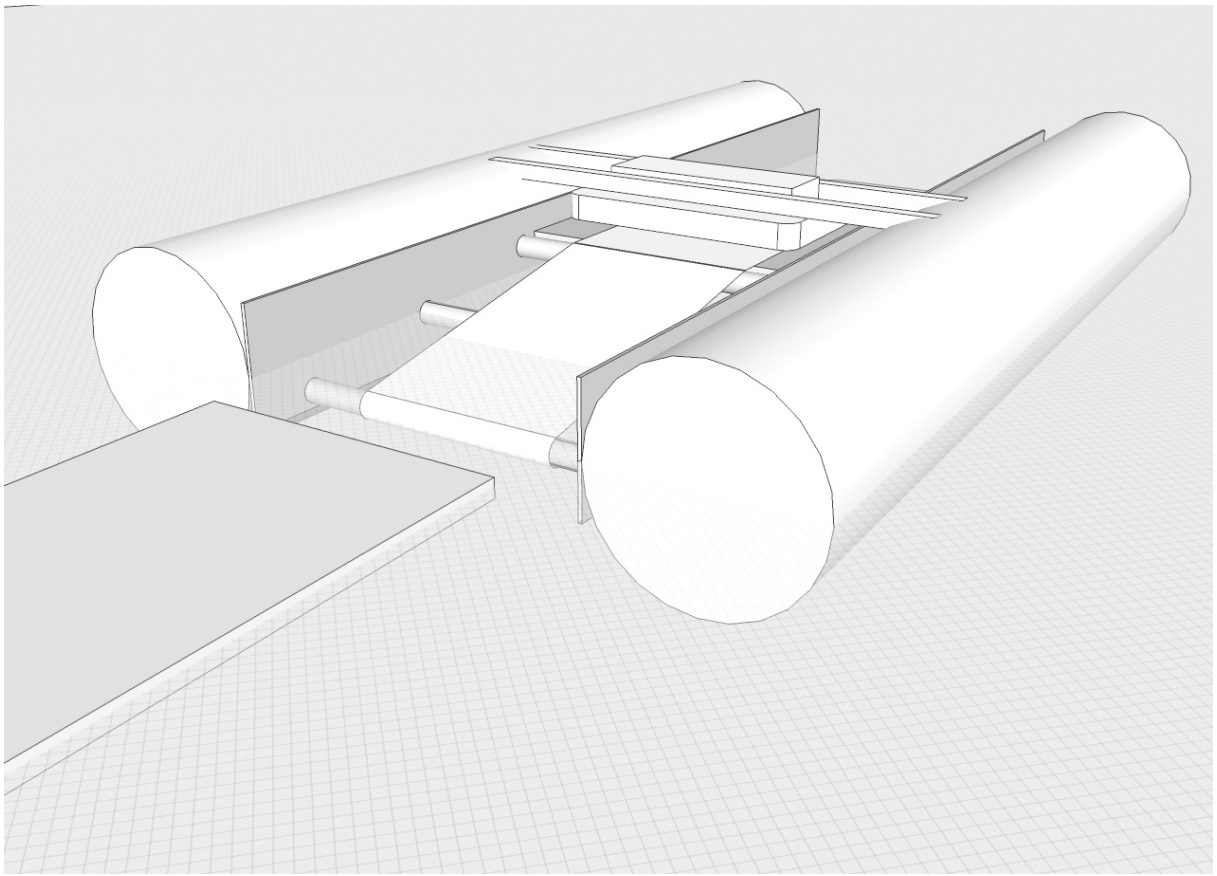


Fig.3. Patented floating mat feeder.

The states of development of the components are different:

1. The supporting structure, pontoons and the outboard motor are optimized already.
2. The floating mat feeder also has proven successful. Initially, the mats unexpectedly softened as a result of being soaked in water for two years and slipped through the rotatable rollers of the processing area. This deficiency could be remedied meanwhile.
3. In 2011, the *Sphagnum* was still too short to be seized by the rotary mower. Experiments with a brush cutter have not been promising. For this reason, in spring 2012 a sickle bar was tested. Results are expected later this year.
4. The distribution by the moss feeder needs to be improved. As the use of wet plants causes increased requirements, an upstream drainage unit should be installed in 2012.

In addition to the harvest by catamaran tests for harvesting in shallow water were carried out. A wooden platform (4 x 4 m in size) was placed at the experimental site in flat water. The required components of the harvester catamaran shall also be used on the platform.

CONCLUSIONS/DISCUSSION

Some components of the harvester catamaran developed such as the supporting structure, pontoons and mat feeder have demonstrated a good functionality. Other assemblies still needed optimization. For example, the width of floating mats and pontoons requires a special permit for boat transportation by road. Easy dismantling of the supporting structure or the use of different pontoons could lead to reduction of transport width. The total weight of the catamaran exceeds one tonne, but various parts that are currently still important for

adaptations or changes in procedural principles could be removed. The development of drainage and crop removal devices could not be concluded in 2011. The distribution of the moss feeder also needs to be improved. Nevertheless, the principle of the harvest by catamaran is considered reasonable if the water reaches a certain area. The hydraulic power transmission has proven successful, even though a single unit of sufficient capacity was not available. The harvest of the experimental site in autumn 2012 will provide important evidence on handling, lifetime, area performance and harvesting costs. Large amounts of harvested material could then be dried using the waste heat of a biogas plant. Finally the *Sphagnum* will be processed into substrate used in horticulture.

ACKNOWLEDGEMENT

The joint project is funded by the German Federal Ministry of Economics and Technology (BMWi).