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CHALLENGES OF PEATLAND RECULTIVATION IN LATVIA

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SUMMARY

This paper outlines the results of an inventory of earlier research materials and current research on the status of abandoned cutover peat extraction sites in Latvia. The results will inform recommendations for planning different types of rehabilitation and restoration and the work was carried out at the University of Latvia under the ERDF project "Innovation in Peat Studies for Development of New Applications". Twenty five peat deposits were surveyed between 2010 and 2011. Assessments of vegetation and changes in hydrological regime were carried out in these deposits, and the overall situation in the studied areas and prospective after-use options were analysed. The study found that natural regeneration of bogs after their utilisation is the most widely used option. Depending on the wetness of sites, either afforestation, or 'bogging up' or return to peat forming condition takes place in these areas. Only 10% of abandoned peat extraction sites are later used for agricultural or water reservoir purposes.

KEYWORDS: peat deposits, peatland, restoration, rehabilitation

INTRODUCTION

Mires and peat deposits cover approximately 10.7% or 6812 km^2 of the territory of Latvia and constitute an important natural resource for Latvia (Kalnina, 2007). Despite large areas of mires, the country does not have specific strategies for their use and protection. Only specially protected nature areas receive the most attention. In this study, surveying peat deposits that have been exploited during the second half of the 20th century, it was found that successful re-naturalisation takes place in areas where peat has been extracted using the excavation method, provided that that restoration (renaturalisation) has had a chance to progress for more than 15-40 years. In the 1960s, peat extraction technology gradually changed from the excavation to the milling method, which required re-arrangement and expansion of fields.

Until 1965, peat for composting was extracted mainly using bulldozers and excavators. Peat extraction sites in which the excavation method was used were considered the most degraded areas and badly suited for other after-uses, while peat milled peat fields were proposed to be recultivated for forestry and agriculture. As peat extraction methods and intensity changed, methods for planning specific types of after-use are required both on a state and regional scale. The national biodiversity programme (Pakalne, 2008) recommends creation of wetlands in abandoned peat extraction areas, either by allowing the natural processes to re-naturalise the site and/or by blocking the ditch systems.

MATERIALS AND METHODS

Twenty five peat deposits were surveyed in 2010-2011. Assessments of vegetation and changes in hydrological regime were carried out in these areas. The overall, condition of each site and prospective after-use options were also analysed. This study summarises the information and findings accumulated by the State Geological Fund (Latvijas PSR Kūdras Fonds, 1980) with the aim of drawing up an overview of the current situation and changes over recent decades. We surveyed the most typical mires, in which peat was extracted using the excavation method. We assessed the vegetation regeneration characteristics, water regime in the excavated sites, dependence of processes on environmental conditions, type of mineral soil, drainage system etc.. We also looked at differences in water regimes, plant communities and forest stands in abandoned peatlands between sites and the reasons of these differences (Kalniņa *et al.*, 2003).

RESULTS AND DISCUSSION

According to the Latvian Peat Fund data, the distribution of mires and peat deposits by usage types in Latvia is as follows: 50.1% are relatively pristine mires, 18.8% are protected nature areas, 14.1% are used for agricultural purposes after draining (marshes), 7.9% are drained for the purposes of afforestation, 6.2% are prepared for peat extraction, and 2.9% are deemed as completely cutaway mires (Nusbaums and Silamikele, 2011). Currently peat extraction is carried out almost exclusively in raised bogs, mainly by the milling method, or combining milling with block-cutting, in a total area of about 20,000 ha. Cutover peatlands remain relatively flat, and the drainage systems continue to work.

Recultivation and environmentally friendly management issues are pertinent in Latvia, even if the agricultural lands reclaimed at the expense of mires presently are not intensely used. Virgin mires have been mostly affected by intensive draining over the period from 1950 to 1990: fens for agricultural use and raised bogs for forestry use, totalling 22% of Latvia's mires.

After surveying (in 2011) on a random basis mire areas that have been drained or where peat extraction has been performed (the total surveyed area of about 7,500 ha), it can be concluded that a large part (approx. 5000 ha) of these mires successfully regenerate by themselves or renaturalise without any special management measures undertaken. Mires that have been transformed for agricultural purposes and are currently are not intensiveely used, their drainage systems are not maintained, and beavers have dammed ditches in some places. Consequently, these mires partly regenerate and fire hazards decrease.

The situation is similar in forest stands that have overgrown the former mires. In raised bogs that have been partially drained for the purpose of growing forest crops (Cena and Klanu mires, Olgas, and Rozu bogs), ditches slowly overgrow with moss, and the expected volumes of timber growth are not achieved in these forest stands (Hartman M *et al*, 2001; Quinty and Rochefort, 2003).

Completely cut-over areas takes approximately 3% of all mires in Latvia, either overgrow with forest, or slowly become 'bogged up' and rewetted. Mires regenerate particularly successfully – forming vegetation characteristic of natural mires in the areas where peat has

been harvested using the excavation method, in both raised bogs and fens, as evident in Medama bog, Zosu bog, Brigu, Bierinu and Cena mires.

After-use problems of peatlands in Latvia

The intensive drainage works in the first half of the 20th century have had the greatest impact on mires in general. There are no plans relating to restoration of these areas. Although decisions on recultivation of damaged lands were initiated in the 1970s, these measures have never been put into practice and the cutover areas slowly overgrew with poor-quality forest or became 'bogged up' again. Recultivation was planned only for intensive use, e.g. for making fish ponds.

The use of drained fens (marshes) for agriculture also did not give the desired results. It should be noted that, after the restoration of Latvia's independence, most of the drained fens are privately owned; therefore, these marshlands are no longer managed, and drainage systems become blocked, thereby creating favourable conditions for their natural regeneration.

At the same time, drained forests, which are mostly state-owned, are still managed; drainage networks are maintained, roads constructed etc. In previous years, by not implementing the planned recultivation works in cutover marshes and leaving them to natural processes, wetlands have been preserved, and nature itself has created forest stands where the conditions were suitable e.g., in Seda, Zilakalna, Brigu, Zagaru and Livanu mires and, Struzanu bog. When drainage systems are not maintained, they gradually lose their capacity. It turned out that beaver activities of damming ditch systems have an unexpectedly important role in preserving wetlands. However this effect is dual: whereas flooding of cutover peatlands contributes to their regeneration and reduces fire risk, drained forests are also flooded and thus damaged due to dammed ditches.

Cutover areas that have been excavated before the 1990s, where natural processes are progressing, such as, Cenas Mire, are not required to be transformed for another type of use (Pakalne, 2008), as it is no longer realistic except for renovation of drainage systems for forestry purposes or for cranberry cultivation in areas that are not overgrown. Until the 1970s, the areas exploited using the excavation method were considered to be the most damaged in comparison with peat fields where the milling method was applied. Contrary to that, now one can conclude that the excavated peateries regenerate much better, in both moss and grass bogs. Fens regenerate better in areas drained with pumping stations – in both excavated peat extraction areas and milled-peat fields (Kačoru, Ladzēnu, Lielstaldatu and Seda mires). Under favourable conditions, raised bog peat excavations regenerate into bogs in approximately 40 years, as one can observe in Medema bog.

Restoration of mires

When planning and implementing mire restoration works, both those who do the planning as well as the local residents need to undergo a change in mindset. This is because in a climatic zone where annual precipitation is in excess of evaporation the efforts to drain the excess water, so that the bogged areas could be intensively managed, have been ongoing for centuries. Currently the situation has changed, and conservation and restoration of wetlands

are promoted on a global scale (Charman, 2002; Quinty and Rochefort, 2003). The condition in which the cutover peat extraction fields are left is of great importance, and quite often one can predict in advance what natural processes would occur there (except for beaver activity).

Of course, there are significant differences between the conditions of regeneration in fens and in raised bogs. Fens form in groundwater-fed conditions; bogs develop by receiving moisture in the form of precipitation. Analysis of the surveyed mires shows that the regeneration period is prolonged if ditches are not blocked, especially in milled fields.

The first measures of hydrological regime restoration in the drained areas of mire nature reserves carried out under the EU LIFE project "Implementation of mire habitat management plan for Latvia" (Pakalne, 2008) showed the lack of relevant practical experience in Latvia. Damming of ditches in cutover mires is easier, because in such areas it is possible to move around, work with machinery and build more massive dams. Peat is drier and more durable as a building material, and it can be mixed with mineral soil. Draining of excess water through structures during spring and summer floods is critical, so that dams and dykes are not washed away. The type of mineral soil under peat has a major role in water retention. Since ditches usually reach the mineral soil layer, permeable soils absorb surface waters right through the bottom of the ditch. To determine the soil properties, we recommend carrying out water level raising tests in the areas that have been excavated first during peat harvesting. Such tests ensure more accurate planning of water level increase in the abandoned peat cutting areas. If pumping stations were used for drainage, water bodies can be easily created after peat mining fields have been exhausted; however, if they are shallow, they quickly overgrow, as can be observed in Sedas, Kacoru, Ladzenu mires.

If there are plans to restore a cutover mire, conditions are favourable in those peat extraction areas where, in preparing new fields, the recently removed bog surface layer has been dissipated to the areas where peat extraction is already finished. Cutover mires for the most part overgrow with forest stands, the growing conditions of which are directly dependent on the terrain, peat field exploitation quality, drainage system condition and thickness of the remaining peat layer. In most cases, the middle parts of the fields are excavated deeper, whereas ditches and former peat storage pile areas remain up to 1.5-2 m higher and, therefore, overgrow first, usually with birches. Conditions of tree growth are worse in the middle parts, as the groundwater level is high there.

The first cranberry cultivation fields in cutover peat excavation sites in Latvia were laid out in the 1970s. They were prepared following the recommendations of Canadian cranberry growers. Pumping stations supplied water from the river to these fields, and the water level was controlled. Yet, this cranberry cultivation method did not take roots in Latvia. Cranberry and Highbush Blueberry cultivation in cut-over peatlands reached a peak after the restoration of Latvia's independence, although the total area makes for just a few per cent of the cut-over peatlands now. It should be noted that operational groundwater levels are different for peat extraction and berry cultivation: the former requires a maximally dry bog surface, the latter – a high groundwater level and water reserves for watering. Particular success was observed in fields where a layer of barely decomposed peat is left. This condition is optimal for cranberries, as there is a proper acidity level, not much weeds etc.

Surveying the ponds that have formed after peat extraction, it can be concluded that fens have the best conditions for creating water bodies, especially if water pumping has been performed.

However, it should be taken into account that such water bodies will gradually overgrow due to shallow water.

In the 1970s, following the government decisions regarding the recultivation of damaged lands, studies on their use for forestry and agriculture were carried out in cutover peat extraction fields – both in excavation and milled-peat fields. In excavated peat cutting areas, the properties of the mineral soils under the remaining peat layer were studied. The same was done in peat milling fields.

At the same time, the cutover fields were also sown with crops and grass. Even if the study results were considered positive, the use of abandoned peat fields in agriculture was not implemented in practice. It should be borne in mind that peat extraction in a peat cutting area takes place gradually, depending on the depth of peat. That is why part of these areas should be recultivated simultaneously with extraction still going on in the areas where peat is deeper, making the recultivation more difficult.

The study established that cut-over peatlands in Latvia are for the most part left to natural processes: either afforestation, or ‘bogging up’ takes place depending on the wetness and ditch slopes; former peat storage pile areas revegetate more intensively, gradually reaching the parameters corresponding to birch or pine forest stands, and increasing the fire hazard risk. In lower lying areas, drainage conditions gradually deteriorate and trees stop growing, giving place to more intense growth of mire-specific moisture-loving plants (cottongrass, beak rush, *Sphagnum* species), and contributing to mire regeneration. If pumping stations have been operated during the final stages of peat extraction process, the cutover area is flooded with water afterwards. Further development of the situation depends on the depth of the raised water level.

CONCLUSIONS

In Latvia approximately 50% (340 thousand ha) of the total mire and peat deposit areas are relatively virgin, about 18% or 128 thousand ha of mires are with protected areas. The abandoned cutover peat extraction areas are mostly left to natural processes, and only a few per cent of those are used for agriculture, water reservoirs and berry cultivation. Mire areas where tree growth has reached the corresponding parameters developinto forest stands.

Currently it is not expected to recultivate the cutover peat excavation sites, since natural processes have been taking place there for at least 40 years and these areas are ‘bogging up’ again. However, if necessary, this process can be accelerated using hydrotechnical measures.

Only a few hundred ha have been reclaimed for agriculture (not including cultivation of cranberries and other berries), and meanwhile it is not expected to reclaim new areas, as there are unused mineral soil areas prepared for agriculture.

In case of need, rehabilitation or restoration works should be planned in the areas that have recently been excluded from production and the recultivation of which would not interfere with the ongoing peat extraction works in the same site.

In view of the fact that extraction sites are abandoned gradually and at different locations within a peat cutting sire, it is preferable to prepare a management plan for the entire area in

advance in order to know the thickness of the protective layer to be left and the conditions required for the relevant type of utilisation.

A mire protection and utilisation strategy is needed, as since the late 1980s the main focus has been just on the protection of mires, without planning their utilisation.

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